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THE NEW
INTERNATIONAL
ENCYCLOPÆDIA

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SECOND EDITION

VOLUME I

NEW YORK
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PREFACE TO THE FIRST EDITION

THE work which is now given to the public after years of diligent preparation is not a new edition or revision of the *International Cyclopædia*. It is not based upon that or upon any other publication. The comparatively small portion of text which has been retained unaltered from the *International Cyclopædia* and incorporated in these volumes has been so retained because it has successfully stood the test of searching criticism, and because the Editors regard it as satisfying the most exacting requirements. This, however, is the full extent of the new Encyclopædia's obligation to the old. The present work has been planned and executed as a wholly independent and original undertaking. It represents the practical knowledge gained from an editorial experience of many years. It embodies the results derived from a critical study of all the most famous works of reference which have at any time appeared in Europe or in the United States.

Every encyclopædia which has secured a lasting hold upon the confidence of the reading public has necessarily been distinguished by some especial merit of its own; yet in the case of each existing publication, this peculiar merit has invariably been offset to a greater or less extent by some counterbalancing defect. Hence, there has always been discernible a decided difference of opinion, both among critics, and among readers, as to which one of the standard encyclopædias best fulfils the proper function of such a work. The ideal encyclopædia is one that combines four attributes: first, accuracy of statement; second, comprehensiveness of scope; third, lucidity and attractiveness of presentation; and fourth, convenience of arrangement. Any compilation of this character, which conspicuously fails to embody all of these essential qualities, falls short to that extent of the ideal; and it must be said that no one of the great encyclopædias which are already in existence can fully stand this test. In the course of time there have gradually been developed three distinct and well-known types of encyclopædic publications, each one of which may be regarded as the concrete expression of a single predominating purpose. Thus the *Encyclopædia Britannica* represents, in most of its departments, accuracy combined with fullness of detail, and in its own especial sphere, which is that of science, it long remained without a rival. It is, indeed, as every one is well aware, far less a true encyclopædia than a collection of elaborate monographs, so scholarly and so diffuse that many of these so-called articles have actually been published separately as treatises on their respective subjects. Nevertheless, the *Encyclopædia Britannica*, though its authority has been very great, has never proved to be a wholly adequate and satisfactory work of reference. In the first place, through the massing of its information under a comparatively few titles, it is ill adapted for popular use, even with the aid of the ponderous index which its publishers appended to it in a final volume. In the second place, it omits so many topics of general interest as to oblige its purchasers to supplement it by some more popular if less monumental work. Finally, the treatment of its most important topics is extremely technical and therefore to the great majority of readers almost unintelligible. Hence, the *Encyclopædia Britannica*, while generally accurate and authoritative, is neither truly comprehensive in its scope nor lucid in its method of presentation, while it is decidedly inconvenient for purposes of ready reference.

The great French encyclopædia of Larousse is found in every important library throughout the world, and it is in some respects a model work. In it, the different departments are judiciously divided, and they are treated in detail under the separate titles most appropriate to these divisions. The work, moreover, is unusually complete, and the literary treatment of the different topics included in its text is clear and at times vivacious and entertaining. There exists, however, throughout its pages a lack of accuracy which frequently misleads the reader, while the number of the volumes and their excessive bulk render the encyclopædia both inconvenient in use and almost prohibitory in cost.

The famous *Conversations-Lexikon*, completed and first published by Friedrich Arnold Brockhaus in 1812, and continued by him and his successors through many subsequent editions down to the present time, is an approximation to the ideal encyclopædia. Its accuracy has become proverbial. Its selection of topics and its careful division and subdivision of them for treatment in detail have secured both comprehensiveness of scope and convenience of arrangement. Where it falls short of approaching something like perfection is in the dryness of its narration and its thoroughly German

neglect of literary form. Nevertheless, on the continent of Europe it has long been accepted as the standard encyclopædic work of reference, and it has been translated and imitated in almost every country, notably in the valuable and popular encyclopædia of Chambers, of which the edition that appeared at Edinburgh in 1860 was not only based upon the *Conversations-Lexikon*, but was confessedly in part translated from it.

These three types of encyclopædia represent, as it were, the survival of the fittest, and each of them owes something to the others. Historically, all three have been developed out of the ponderous compilations of the eighteenth century, among which Zedler's *Universal-Lexikon*, in sixty-four volumes (1750), d'Alembert and Diderot's famous *Encyclopédie* in twenty-eight (1772), and Ersch and Gruber's *Allgemeine Encyclopädie* in more than one hundred and sixty volumes remain the most remarkable examples. The gradual evolution of the modern encyclopædia forms, indeed, an interesting study. The older works originally grouped their articles under related departments rather than in alphabetical order; and it was only after many years that the alphabetical arrangement came into general use as being infinitely more convenient for the reader, even though theoretically less scientific. The elaborate system of cross-references, which is now a subject of especial study on the part of all encyclopædic editors, was first developed by Ephraim Chambers in the early part of the nineteenth century. The elucidation of the text by means of diagrams, maps, portraits, colored plates, and other illustrations, was at first quite sparingly employed; but it was an interesting feature of the *Encyclopædia Britannica*, and was finally adopted on a very lavish scale by Brockhaus and by Meyer in Germany.

All modern encyclopædias have incorporated these three features as being absolutely essential. Such fundamental differences as are perceptible between them will be found to exist partly in the scope and purpose of each separate publication, and partly in the method by which the original design has been carried out by those to whom the task has been committed. It therefore seems desirable that, in writing these words of introduction, the Editors of the NEW INTERNATIONAL ENCYCLOPÆDIA should set forth as briefly, yet as clearly as is possible, the manner in which they have endeavored to insure at least a close approximation to what, in their best judgment, an ideal encyclopædia should be.

Since accuracy is very properly regarded as the most essential of all the attributes of such a publication, the Editors have been at especial pains to make this work in its several departments fitly representative of modern scientific scholarship. There has long prevailed in certain quarters a definite yet quite untenable belief that this result can be most satisfactorily attained by assigning sets of articles to separate contributors of eminence, for them to write what pleases them and then to sign what they have written. The signed article, it has been claimed, is the best possible guarantee of accuracy, since it carries with it the weight and the authority of its author's name. This theory, however, will not bear a close examination. For it is evident that no single specialist, however eminent, can be so thoroughly equipped at every point as to leave in what he writes no room for criticism. He has his individual preferences strongly marked, and necessarily also his individual bias. In treating matters of scientific doctrine, therefore, he will quite unconsciously give to his statements the coloring of his own personal beliefs. In discussing controversial topics, he will with the same unconsciousness lay more stress upon the theories which he holds himself than upon those which are accepted and maintained by other men of equal eminence. Moreover, he is apt to assume upon the reader's part too great a familiarity with the subject, and hence to employ language which is excessively technical and difficult to understand. Finally, when the individual contributor is permitted to treat his chosen topics in his own way and without reference to what other contributors have done, there will necessarily result a lack of symmetry and proportion which will be perceptible to the most casual reader of the completed work. These facts have been so often demonstrated in the past as to have led the editors of the Brockhaus *Conversations-Lexikon* to reject the signed article altogether, and to substitute for the individualistic system another system under which each article, though originally written by a single specialist, is subsequently criticised by other specialists through whose hands it passes and by whom it is so modified as, in its final form, to be no longer the work of one particular individual. It represents instead the collective knowledge and the different view-points of a number of highly trained and able men, while it usually receives, as well, a finishing touch from the general editor, who bears constantly in mind the inestimable value of simplicity, proportion, and clearness. No signed article can ever have the completeness, the authority, and the practical value of an article prepared in such a way as this; and the proof of the assertion is found in the undisputed fact that the encyclopædia of Brockhaus has been universally recognized as the most minutely accurate work of reference that exists to-day. Moreover, as a practical matter, the signed article frequently involves a certain inevitable deception. As new editions of an encyclopædia appear, a multitude of changes in the text are necessarily demanded in order to add new facts and modify old theories; and these changes are often made by other hands than those of the original contributors, so that many articles to which a writer's name is signed are no longer in reality his own. Hence the Editors of the present work

have, after much deliberation, dispensed entirely with the signed article. In its stead, they have arranged that every important contribution to the work, while written by a specialist of acknowledged competence, shall nevertheless pass through other hands and receive its final form upon the basis of mutual discussion, criticism, emendation, and suggestion. It is proper here to acknowledge the great value of the assistance rendered by Mr. Louis Heilprin, who has read all the proofs, and whose minute and varied knowledge and wide experience have assured a very high degree of accuracy.

In the second place, the endeavor has been made to render this Encyclopædia more comprehensive in its scope than any other. The rapid march of science during the past few years, the new inventions and discoveries that have been made, the political and social changes that have been effected, and the multitude of absolutely new interests that have arisen in almost every department of human activity, have added an immense mass of topics to the list with which former encyclopædias have had to deal. It is believed that all these topics have here received adequate and accurate attention; while a much greater completeness than is usual will be found in the treatment of nearly every department. It is desirable to call especial attention to the amount of space that has been given to the subject of Geography, both physical and political, and to the carefully selected information relating to municipal organization and the management of public utilities — information such as has never before been systematically given in any encyclopædia published in the English language. Something also should be said of the fullness and the modern character of the articles bearing upon the several departments of Biology, Botany, Education, and Psychology, the Mechanical Arts, Physics, Military and Naval Science, Sociology, and Biography. As to the last-named subject, it may be said, without fear of contradiction, that no encyclopædic reference-book in England or America contains as titles so many names of men and women; while the information given under these titles is brought down to the very eve of the publication of this work. Another department of great interest and value is that which has to do with what may be called miscellaneous information and which covers a range of topics not heretofore included in a general encyclopædia. Under this head will be found, for instance, the titles of famous books, comprising works of fiction, the names of the important characters in imaginative literature, the explanation of political nicknames and popular allusions, and in fact all that class of subjects which has ordinarily been found only in Readers' Handbooks, and similar special compilations. It should be noted, too, that the pronunciation of all unusual, technical, or foreign words has been carefully figured in accordance with a simple phonetic system, and that their etymology has been systematically traced. This etymological work has been done with careful regard to the conclusions of the newest school of philological research, and the facts are set forth as simply and as clearly as is possible. For the convenience of the general reader, all the words and stem-forms belonging to the Græek or to the Oriental languages have been transliterated. Care has been taken to supply every important article with a well-selected bibliography for the guidance of those who may wish to pursue the subject in all its ramifications; and the bibliographical material will be found to comprise not only the standard works, but also special monographs, pamphlets, and papers published by the various learned societies. The Encyclopædia as a whole, then, is in reality a library whose books are so divided and arranged as to make the information which they afford immediately and conveniently accessible to the reader. It is this completeness which justifies the title "International" in its application to this work. The word is one which possesses a new significance to Americans at the present time, when our country has shaken off its former isolation, and has developed so many points of contact, political and commercial, with the other nations of the earth. Yet while the work is international, it is international from an American point of view, and it very naturally gives the fullest treatment to those topics which are of immediate and vital interest to Americans.

(With regard to the third essential — lucidity and attractiveness of presentation — the recognition of its value which has been expressed above, will afford, perhaps, a clue to what the Editors have endeavored to accomplish.) There exists a kind of writing which has become so stereotyped as to be well known to every one, and which might be fittingly described as the encyclopædic style. It is in literature what a monotone is in music — utterly devoid of individuality, of variety, and of interest. It sets forth every possible subject in the same dull way and robs the most living themes of their vitality.† This style has even acquired, by the influence of tradition, a pseudo-sanctity, until many persons have become convinced that an encyclopædic article must inherently and inevitably be a synonym for dullness. This view the editors are very far from entertaining, or from desiring to perpetuate; and so the principal contributors have been selected not only for their special knowledge, but also for their possession of a clear, attractive style; and in those articles of which the subjects lend themselves to a distinctly literary treatment, the authors have been expected to write with the same freedom and with the same personal touch as would characterize their contributions to any literary publication of a high class. As the Encyclopædia is intended first of all for the general reader, it has been written from the general reader's point of view, and in such a way as to be free from all vexatious technicalities. Regard, moreover, has been had to form, and to a logical order of presen-

tation. In every detail, the endeavor has been made to compact really valuable information instead of loosely assorted and often unrelated facts. Even the statistics, which in many works of this character are thrown together in a mass, have been used in such a way as to exhibit comparisons which are significant and which possess an interest of their own for every person of intelligence. In short, the aim has been consistently to present each subject not only so as to inform, but likewise so as to attract and entertain.

The fourth essential of a useful encyclopædia is found in the practical convenience with which it may be consulted. This practical convenience has been studied very carefully both by the Editors and by the contributors with the object of enabling a reader to find, with the least possible expenditure of time and patience, the information of which he is in need. This end has been attained, first, by giving a conspectus of each topic as a whole; second, by treating the same topic more in detail under all the natural divisions into which it falls; and finally, by working out a system of cross-references which may serve as guides from each topic to the others which supplement it and provide the collateral information necessary to its fullest understanding.

It is thought that the illustrations of every kind will be found superior to anything hitherto attempted in any encyclopædia. These illustrations have not been gathered together in a haphazard fashion and merely for the purpose of providing the volumes with a certain number of attractive pictures; but they were suggested and selected by the various contributors, or prepared with their coöperation. In many cases much assistance was derived from the Governmental Departments in Washington, where all the plates relating to Natural History were examined and verified by experts in the Government's employ.

The Editors are thoroughly aware of the formidable character of their undertaking. No one, in fact, who has not been intimately associated with the making of a great encyclopædia can fully understand the difficulties which are inherent in such a task, involving as it does the coöperation of a large body of highly trained and scientifically qualified experts, and demanding so many and such varied forms of effort — organization, selection, knowledge, literary skill, critical judgment, and a true sense of proportion. Nor has it been forgotten that such a work as this should be something more than a convenient book of reference. Encyclopædias have in the past performed, and they are still performing, a remarkable educational function in disseminating exact knowledge upon an immense variety of subjects. It would be difficult to overestimate the influence which has been exercised by such famous works as those which have been mentioned in the preceding pages; for they have been really libraries, and to thousands upon thousands of families they have been the only libraries available. To prepare a book which shall professedly discharge a function so important is no light undertaking; to obtain even a fair measure of success is a memorable achievement. It is the hope of the Editors of this Encyclopædia that the test of time will show them to have profited alike by the merits and by the defects of the works which have preceded it; and that the result may be approved as embodying the experience of the past with an intelligent conception of the requirements of the present.

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NEW YORK, June, 1902.

PREFACE TO THE SECOND EDITION

THE First Edition of the NEW INTERNATIONAL ENCYCLOPÆDIA was published in 1902-4. The progress and changes during the ten years that have since elapsed have necessitated a thorough revision of the entire text, the expansion of many departments, and the inclusion of many new articles. So radical were the necessary changes and so extensive the additions that the publishers decided to reset the entire work instead of merely cutting the plates, and to add three new volumes besides increasing somewhat the size of the page.

In carrying out this work the articles have been classified in departments and the head of each department has examined carefully the text of every article and made such changes as were desirable in view of the later information available, including the expansion of the existing text and the addition of new articles, whenever necessary, subject to the rules of proportionate treatment.

The Second Edition retains the essential features of the First, namely: the placing of the subjects under titles to which the reader would naturally turn first, the use of a single alphabet with so copious a supply of cross-references as to dispense with the necessity of an index, a very inclusive title list, a full and practicable bibliography for all important subjects, the latest valuable authentic information available on each subject, the etymology and pronunciation of all unfamiliar titles, the distribution of subjects under their own titles rather than in groups, and a comprehensive and so far as possible non-technical treatment to meet the needs of the greatest number of users.

FRANK MOORE COLBY,
TALCOTT WILLIAMS.

April, 1914.

KEY TO PRONUNCIATION

<p>ā as in ale, fate. Also see ě, below. ā " " senate, chaotic. â " " glare, care, and as e in there. See ě, below. ă " " am, at. ä " " arm, father. â " " ant, and final a in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ÿ). a " " final, regal, where it is of a neutral or obscure quality. a " " all, fall. e: " " eve. e: " " elate, evade. ě " " end, pet. The characters ě, ā, and â are used for ä, ae in German, as in Baedeker, Gräfe, Händel, to the values of which they are the nearest English vowel sounds. The sound of Swedish ä is also sometimes indicated by ě, sometimes by â or ä. ě " " fern, her, and as i in sir. Also for ö, oe, in German, as in Göthe, Goethe, Ortel, Oertel, and for eu and oeu in French, as in Neufchâtel, Crèvecoeur; to which it is the nearest English vowel sound. e " " agency, judgment, where it is of a neutral or obscure quality. ī " " ice, quiet. ī " " quiescent. ī " " ill, fit. ō " " old, sober. ō " " obey, sobriety. ô " " orb, nor. ǒ " " odd, forest, not. o " " atom, carol, where it has a neutral or obscure quality. oi " " oil, boil, and for eu in German, as in Feuerbach. oō " " food, fool, and as u in rude, rule. ou " " house, mouse. ū " " use, mule. ū " " unite. ũ " " cut, but. u " " full, put, or as oo in foot, book. Also for ü in German, as in München, Müller, and u in French, as in Buchez, Budé; to which it is the nearest English vowel sound. û " " urn, burn. y " " yet, yield. B " " the Spanish Habana, Córdoba, where it is like a v made with the lips alone, instead of with the teeth and lips. ch " chair, cheese.</p>	<p>D as in the Spanish Almodovar, pulgada, where it is nearly like th in English then, this. g " " go, get. G " " the German Landtag, and ch in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat. H " j in the Spanish Jijona, g in the Spanish gila; where it is a fricative somewhat resembling the sound of h in English hue or y in yet, but stronger. hw " wh in which. K " ch in the German ich, Albrecht, and g in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of h in hue, or y in yet; or the sound made by beginning to pronounce a k, but not completing the stoppage of the breath. The character k is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan. n " in sinker, longer. ng " " sing, long. N " " the French bon, Bourbon, and m in the French Étampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce "onion" without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by N, as in the case of São Antão. sh " " shine, shut. th " " thrust, thin. TH " " then, this. zh " z in azure, and s in pleasure. An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kǎz'm (chasm). Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds. When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.</p>
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THE NEW INTERNATIONAL ENCYCLOPÆDIA

A a. The initial letter of almost every alphabet. The Runic Futhark is an exception to this rule. In this alphabet *a* stands in the fourth place. The Ethiopic likewise departs from the common arrangement, aleph occupying the thirteenth place instead of the first. As our alphabet directly follows the Latin, which itself is based on the Greek, the form of our letter *A*, *a* agrees with the same character in those languages. The letter was called alpha in Greek. In form it agreed with the first letter of the North Semitic alphabet, which was called aleph, and the name evidently came from the same source, though possibly through an Aramaic channel, if the ending *a* is the sign of the emphatic, and not a Greek addition. In the Semitic languages aleph is a consonant, although it has a tendency to lose its consonantal force. There being no corresponding sound in Greek, the letter was employed as a vowel. As to the ultimate origin of this letter nothing is yet known with certainty; but in recent years there has been a strong tendency to abandon the assumption of an immediate derivation of the North Semitic alphabet from Egyptian hieroglyphics or hieratic signs, or from Babylonian cuneiform characters, and to look for a solution of the problem to the later Cretan system of writing transferred to Syria by the Philistines, as Evans does in *Scripta Minoa* (1909), or to linear pottery marks found in many Mediterranean countries, as Flinders Petrie has suggested in *The Formation of the Alphabet* (1912), or to the signs of the lunar zodiac, as is done by Stucken in *Das Alphabet und die Mondstationen* (1913). None of these theories, however, can be supported with sufficient evidence. We do not know the meaning of the Cretan characters, whether the pottery marks have any phonetic value at all, or what signs may have been used in Syria at the time of the invention of the alphabet for the stations of the moon. (See ALPHABET.) The small or uncial *a*, used in ordinary print, is only a modification of the capital *A*. This style of writing prevailed from the second to the seventh centuries of the Christian Era, and is due to the law of least effort. When the scribe began to use papyrus instead of tablets of wax, he traced the letter at one stroke, without lifting his pen from the paper, thus *q*. (Prou, *Manuel de Paléographie*, 3d ed., Paris, 1910, p. 61.)

Phonetic Character. *A* is the vowel sound that is articulated with the least effort. It is the earliest vowel sound uttered by the baby, before it has acquired control over the muscles of the tongue. It is described by phoneticians as a "mid-back-wide" vowel, formed with a wide opening of the jaws, pharynx, and lips. It had what we may term the *ah*-sound, familiarly known as the "Italian," or "Continental" *a*, as in English *father*. (Sweet, *Sounds of English*, Oxford, 1908; Rippmann, *Sounds of Spoken English*, London, 1910.) Such is approximately the original sound of this letter. In English, however, as in other languages, it has undergone many modifications, due mainly to the influence of surrounding consonants. At the present time, instead of calling the letter itself by the name *ah*, as in most Indo-European tongues, we term it *ay*, and write its plural *aes*, *A's*, *As*. (Cf. Tennyson, *The Epic*, ad fin.: "Mouthing out his hollow *oes* and *aes*.") Though somewhat rare in modern English, the *ah*-sound was of quite frequent occurrence in the earliest English or Anglo-Saxon. It was subject, however, to so many modifications and shiftings that it is now difficult to ascertain the number and varieties of the sound. (See PHONETIC LAWS.) In addition to these modifications, other external influences have tended to alter the sound still more. The orthography has failed to keep pace with the changes in pronunciation; hence the anomalous character of *a* as a sound-symbol. Among the numerous sounds that *a* may represent in English, the following are perhaps the most common: *bat*, *bate*, *ball*, *bar*, *bare*, and *what*, or *wash*. To these may be added the sound of *a* in *ask*, *fast*, *ant*, which varies with different speakers, and is probably intermediate between *bat* and *bar*. Furthermore there is the neutral sound of *a*, approaching the *u* in *but* (or the mute *e* of the French *le*), that often occurs in unstressed syllables, like *aboard*, *abundant*, and also the *a* in *any*, *many*, where it approaches a short *e*. Before *l* we find also *au* expressing the same broad sound as *a*, thus *fault* beside *false*. We inappropriately call the *a* in *bate* "long *a*" in contrast with the "short *a*" in *bat*, although the "long *a*" is not strictly one sound, but ends with a glide, like the *e* in *they*.

Indo-European *a*. In the primitive Indo-European, as in most of its descendant dialects,

the *a* (*ah*-sound) had both a short and a long quantity. In the primitive Germanic, however, the long *a* was changed into long *o*; hence it is the short vowel alone that has remained in English. As an example of a primitive short *a*, we may take Indo-European **agro-s*, 'field'; Skr. *ájra-s*; Gk. *ἀγρό-s*; Lat. *ager*; Goth. *akr-s*; Old Eng. *æcer*; Eng. *acre*. As an example of the primitive long *a*, we may take the Indo-European **māter-*, 'mother'; Skr. *mātā*; Gk. *μᾶτηρ*; *μήτηρ*; Lat. *māter*; Old Eng. *mōdor*; Eng. *mother*. See PHONETIC LAWS; and cf. Wright, *Historical German Grammar* (London, 1898).

As a Symbol. Inasmuch as *a* stands at the head of the alphabet, it is therefore commonly used to denote the first in an order or series. Thus, in musical notation (q.v.), it denotes the sixth note of the diatonic scale of C major, or the first note of the relative minor scale of C; the *la* of French, Italian, and Spanish musicians. In the mnemonic words of logic (q.v.), it denotes the universal affirmative proposition, such as, "all men are mortal." The letters *a*, *b*, *c*, are also used in algebra (q.v.) to denote the known quantities as opposed to *x*, *y*, *z*, the unknown quantities. In abstract reasonings, hypotheses, etc., A, B, C, are likewise employed as convenient designations for particular persons and things in relation to the others of a series or group. In writing or printing, the series *a*, *b*, *c*, is commonly used, along with or instead of the Arabic numerals, for marking paragraphs or for reference. In nautical matters, the terms A1, A2, A3 are used (in Lloyd's Register, for example) to indicate the character and condition of vessels, and similarly in business matters to denote the commercial standing of a house. This usage has passed over into popular parlance as an adjective of commendation, so that a person is sometimes spoken of as "A1" to indicate that he is a thoroughly reliable, "first-class" man. A stands also as the first of the Dominical Letters (q.v.).

In Grammatical Forms. This same letter is used in a number of phrases and grammatical forms in English. In the first place, it is employed, beside *an*, as an indefinite article; both forms are weakened from the AS. *ān*, 'one, an.' In provincial expressions *a* ('a) appears as a pronominal form for *he*, etc., as in *quotha*, 'quoth he.' It is also used in dialects in place of *have*, as an auxiliary, or even as a principal verb. As a modern provincial corruption, it is used in lieu of the pronoun *I*. It appears as a preposition for the AS. *an*, *on*, meaning 'on, in,' with a verbal noun in such ancient phrases as *a-hunting*, *a-building*; also as a reduced form of the preposition *of*, now generally written *o'*, in *Jack-a-lantern*, *John a Gaunt*, *man-o'-war*; for *on* in *asleep* (AS. *on slæpe*), *away* (AS. *on weg*), *twice a day*, *now a days*; for *off* in *adown* (AS. *of dūne*); for AS. *of-*, intensive, in *athirst*. Sometimes it stands for the Latin preposition *ā*, meaning 'of, off,' as *a priori*, *Thomas a Becket*. As a verbal prefix, it often stands for AS. *ā-*, equivalent to the modern German *er-*, originally implying 'motion away,' but in earlier English merely intensive, as in *awake* (AS. *āwacen*, Ger. *erwachen*), *arise* (AS. *ārisan*), and in many other phrases. See ALPHABET and ABBREVIATIONS.

A. 1. A symbol used in the classification of

the scale C major or the tonic in the scale of A minor. Before the tenth century A.D. it was actually the first or lowest tone of the fundamental scale, which was A, B, C, D, E, F, G. (See GREEK MUSIC.) 2. As a fixed tone *a'* (435 vibrations) is the standard by which all instruments are tuned. 3. In theoretical works A denotes the triad of A major, and *a* the triad of A minor. 4. In the scores of works requiring more than one performer the letters of the alphabet are used as guides, to enable the performers to find their place readily in case of repetition during rehearsals.

A1. A symbol used in the classification of wooden ships by Lloyds Maritime Insurance Association. The designation follows as a result of examination of a ship by one of the Lloyds surveyors. The symbol A1 denotes that hull and equipment of the ship in question are in good condition; the letter A standing for construction and the numeral 1 for equipment; when the latter is inadequate the figure 2 is used. Should the symbol be preceded by figures, thus, 12A1, it means that the classification is good for 12 years. A1 vessels may receive further extension of classification (1 to 8 years), and the symbol becomes 12A1-Cont. 6A1, which means original 12-year class continued 6 years. If later restored it would still be possible to remain in A1 class with the following symbol: 12A1-Cont.6A1-Rest.6A1. When a vessel has passed the age for the character A, but is still found fit for conveying perishable goods to all parts of the world, it is registered A in red. Ships designated A in black form the third class, and are allowed to carry perishable goods on *shorter voyages*. For further information in regard to the classification of ships for marine insurance, see SHIPS, CLASSIFICATION OF, FOR MARINE INSURANCE.

AA, ä. The name of numerous small rivers in Europe, of which the best known are the Münster Aa and the Westphalian Aa in Germany, and two rivers in the Baltic Provinces, West Russia, both emptying into the Gulf of Riga. Besides these nearly forty others have been enumerated. The word is said to be of Celtic origin, but it is allied to the O. N. *á*, O. Ger. *aha*, Goth. *ahva*, identical with the Lat. *aqua*, 'water.' Ach, Aach, and Aachen (pl.) are other forms of the same word.

AACHEN, äg'en. See AIX-LA-CHAPELLE.

AAHMES, ä'mës. See AMASIS.

AALBORG, al'börk (Eel-town). An ancient episcopal city of Denmark, capital of the Amt of Aalborg, in Jutland, on the south shore of the Limfjord (Map: Denmark, C 1). The town has a cathedral, a museum, a nautical school, and a library. It is situated on one of the branches of the Danish State Railway, which here crosses the Limfjord on an iron bridge 990 feet long and 16 feet wide. The manufactures of the town are considerable, consisting chiefly of brandy and spirits, cotton goods, dyed articles, cement, and lumber. There is an electric lighting plant. There are some shipbuilding and sea trade, the latter with England, Norway, and Sweden, for the most part in vessels owned by citizens of the town. Fish is the leading article of export. The harbor is safe but too shallow for large vessels. Aalborg has long been an important commercial centre. It was plundered by Wallenstein in 1627 and by the Swedes in 1644 and 1657. Pop., 1890, 19,503; 1906, 31,509; 1911, 33,449.

AALEN, ä'len. A town of Württemberg, Germany, 47 miles by rail east of Stuttgart, on the Kocher River, 1420 feet above sea level (Map: German Empire, D 4). There are cloth manufactures and large iron works. The poet Schubert spent his boyhood in this town, and there is a statue erected in his honor. Pop., 1910, 10,400.

AALESUND, ä'le-sün. See ALESUND.

AALI, ä'lê, MEHEMET, Pasha (1815-71). A Turkish statesman and diplomat. He entered the public service at 15 years of age; was secretary to the Embassy in Vienna in 1835, and from 1840 to 1844 Minister in London. He then became Minister of Foreign Affairs and several times after 1852 was Grand Vizier. He was also promoted to the rank of Field-Marshal and Pasha. In 1856 he represented the Porte at the Congress of Paris and in 1871 took a prominent part in the London conference for the settlement of the Black Sea question. He was favorable to progress and strove earnestly, though ineffectually, to introduce reforms in the Turkish government.

AALST, älst. See ALOST.

AAR, or **AARE**, är (perhaps connected with Skt. *ara*, swift). The largest tributary of the Rhine in Switzerland. It rises in the glaciers west of the Grimsel Pass in the canton of Bern, at an altitude of 7345 feet (Map: Switzerland, C 1), flows northwest and enters Lake Brienz after forming the famous falls of Handeck, 240 feet high. Issuing from Lake Brienz, it enters Lake Thun, passing the town of Interlaken. On emerging from the latter lake, the Aar becomes navigable and, after a winding course northwestward, reaches the Jura Mountains and flows along their southern slope down to its confluence with the Limmat, where it breaks through the ridge and enters the Rhine near Waldshut. Its entire length is about 180 miles, and among its numerous tributaries the most important are the Saane, Zihl, and Emme. Through its tributaries the Aar is connected with some of the principal lakes in Switzerland. The most important cities on its banks are Bern, Solothurn, Aarau, and Interlaken. There are several small rivers of the same name in Germany.

AARAU, ä'rou (*aar* + Ger. *Aue*, meadow, from *aha*, water). Capital of the canton of Aargau, Switzerland, near the Jura Mountains, on the right bank of the Aar, 41 miles northeast of Bern (Map: Switzerland, C 1). It is 1285 feet above sea level and lies in a fertile plain between the Jura and the Swiss plateau. The town is very picturesque and has several museums and a fine cantonal library. There are silk, cotton, leather, and cutlery factories, an iron foundry famed for its cannon and bells, and other workshops. There are fine vineyards on the lower slopes of the Jura Mountains. The town is famous for producing excellent mathematical instruments. North and northeast of the town are the Wasserfluh, 2850 feet high, and the Gisliflüh, 2540 feet high. The river Aar is here crossed by a suspension bridge. Pop., 1900, 7995; 1910, 9536 (commune, 9806).

AARD-VARK, ärd'färk' (Dutch, 'earth-pig'). A burrowing, nocturnal, insect-eating mammal (*Orycteropus capensis*), native and common in South Africa. It is about 5 feet long, including a long, tapering, naked tail. The head is long, thin, and somewhat pig-like, with a tubular snout and high, pointed ears.

The body is stout, fat, and thinly covered with bristly, reddish hairs. The limbs are short, strong, and equipped with claws adapted to digging in hard ground. It inhabits open regions, is timid and mainly nocturnal, lives in burrows, and feeds upon insects, mainly ants and termites, breaking into their "hills" and gathering them into its small mouth by means of its long, protrusile tongue, which is coated with glutinous saliva. The flesh is edible, but likely to taste of the formic acid in its food. A closely allied species (*O. aethiopicus*) inhabits north-eastern Central Africa. These two animals (with several fossil species) represent the Orycteropodidæ, a family of Edentata differing from the remainder of that order in so many respects, for example in the possession of an interparietal, and in character of brain and placenta, that some naturalists have proposed to establish a separate order for it, Tubulidentata. See Plate of ANT-EATERS.

AARD-WOLF (Dutch, 'earth-wolf'). A nocturnal, carnivorous mammal (*Proteles cristata*) of South Africa, resembling a small striped hyena with a dog-like head. It is closely allied to the hyena, from which it differs mainly in its weak jaws and peculiar dentition, which prevent its overcoming and eating vertebrate prey or large carrion. Hence its food consists of small carrion, of grubs, and largely of termites. Its fur is coarse, and capable of erection along the back; in color it is ashy-gray, irregularly striped up and down and around the legs with black; its muzzle is black and nearly naked; legs and feet dark brown in front and gray behind; ears dark brown outside and gray inside. It goes abroad only in the night, and several are said to live in the same burrow. It is the sole representative of the family Protelidæ. See Plate of HYENAS.

AARESTRUP, ä're-strööp, EMIL (1800-56). A Danish poet, born at Copenhagen. He was little regarded during his lifetime, but since the publication of his collected poems, with a critical essay by Georg Brandes, he has been deemed one of the first lyrists of Denmark, noted for his combination of passion and tenderness.

AARGAU, ärgou, or **ARGOVIE**, ärgö've'. A canton of north Switzerland, with an area of 542 square miles (Map: Switzerland, C 1). Its surface is moderately mountainous, and there are a number of fine valleys. The chief rivers are the Aar, a tributary of the Rhine, and its tributaries, the Reuss and the Limmat. There are a number of mineral springs. The soil is very fertile. The vine is cultivated extensively in the river valleys, and the output of dairy products is considerable. The manufacturing industries are well developed and give occupation to about 18,000 people. The production of textiles is the chief industry. For purposes of administration the canton is divided into 11 districts. The legislative power is vested in the assembly (*Grosse Rat*), elected at the rate of one member for every 1100 inhabitants. The executive power is in the hands of a council (*Regierungsrat*) of five members, chosen by the assembly for a period of four years. The referendum is frequently resorted to, and for private initiative in legislation 5000 votes are required. In the National Council Aargau is represented by 10 members. The population was 206,659 in 1900 and 230,629 in 1910. The inhabitants are mostly of German origin, and

the German language is spoken by almost the entire population. Capital, Aarau (pop. commune, 9806 in 1910). Aargau, in its original extent much larger than the present canton, was a part of ancient Helvetia, and was subdued by the Franks in the fifth century. It was held by the Hapsburgs from 1173 till 1415, when it was taken from them by the Swiss Confederates, who gave parts of it to Bern and Lucerne. In 1798 the district was divided into the cantons of Aargau and Baden, which became members of the Helvetic Confederation. Ruled mainly by the aristocratic party, Aargau gained a liberal constitution in 1831, and since then has been the champion of democracy against the reactionists and the clericals. Consult: *Historische Gesellschaft des Kantons Aargau* (Aarau, 1898), J. Heierli, *Die archäologische Karte des Kantons Aargau* (Aarau, 1899), and E. Zschokke, *Geschichte des Aargaus* (Aarau, 1903).

AARHUS, ar'hōōs. A seaport and episcopal city of Denmark, capital of the amt of Aarhus, Jutland, situated on a bay of the Kattegat, in a fertile plain, 68 miles northeast of Fredericia (Map: Denmark, D 2). There are here the oldest Gothic cathedral in the kingdom, the construction of which was begun in 1201, a museum, an exchange, and several banks. The inhabitants are engaged in agriculture, shipbuilding, and manufacturing. The town is connected with the rest of Jutland by the State Railroad, and there are regular lines of steamers to Copenhagen and England. The harbor is well protected by a breakwater and admits vessels of 6 feet draught. The town ranks among the oldest in Denmark, for it had the first Christian church and has been the residence of a bishop since 948. Aarhus was the scene of a Danish defeat by the Prussians in 1849. Pop., 1890, 33,306; 1906, 55,193; 1911, 61,755.

AARON, ar'un (Hebrew 'Aharon). The elder brother of Moses (Ex. iv. 14) and first high priest of Israel, according to Ex. xxix. 3, 29; Lev. viii. 12; and Num. xvi. 17. When Moses was sent on his mission of deliverance to Pharaoh, Aaron was appointed his spokesman and performed some miracles, even bringing on some of the plagues. He was always, however, the subordinate of Moses, from whom he received his ordination. While Moses was absent receiving the Ten Commandments, Aaron yielded to the importunities of the people and fashioned for them the golden calf (Ex. xxii. 1-6). Aaron was concerned in two rebellions. In the first, his authority, as well as that of Moses, was called into question by the Korahites (Num. xvi). The miraculous budding of the rod of Aaron settled that dispute. In the other, Aaron, perhaps inspired by Miriam, rebelled against the authority of Moses, but here Miriam was punished. Because of the incident at Meribah (probably the modern 'Ain Kuderat; see KADESH-BARNEA), where Moses and Aaron struck the rock instead of speaking to it (Num. xx. 8-13), Aaron was not allowed to enter Canaan, but died and was buried on Mount Hor (Num. xx. 22-29) or at Moserah (Deut. x. 6), eight stages away from the former place (Num. xxxiii. 31). Eleazar, his son, succeeded to the high priesthood. Modern scholars have called attention to the fact that Aaron appears as a high priest by the side of Moses only in what are regarded as post-exilic additions in the

Pentateuch. In the earlier parts of this work, on the other hand, Moses wields the magic rod (Ex. iii. 17), gives oracles (Ex. xviii), sprinkles the blood and brings sacrifices (Ex. xxiv), and Aaron is only an attendant, like Hur and Joshua. From Moses as the founder of the priesthood the priestly families of Dan (Jud. xviii. 30) and Shiloh (1 Sam. ii. 30) claim descent. Ezekiel does not trace the origin of the priesthood at Jerusalem further back than to Zadok, who lived in the time of Solomon. Aaron as the high priest is supposed to be the reflection of the actual head of the State and its religious cult in the Persian period. The figure itself is connected by Redslob, Dozy, Land, and Ed. Meyer with the ark (Hebrew 'aron), while N. Schmidt looks upon Aaron as originally an Edomitish numen worshiped on Mount Hor in Petra and Moserah (the modern Jebel Madhera) in the Negeb (q.v.) and later remodeled after Jeroboam (q.v.), who also makes a golden calf and has two sons named Nadab and Abihu. The tomb of Aaron at Petra contains a sarcophagus made up of Greek and Hebrew tombstones with inscriptions, showing their modern origin, but the shrine itself was connected with Aaron already in the time of Josephus (Ant. iv. 4. 7) and therefore no doubt also before the Nabataean period. See Oort, "De Aaronieden" in *Theologisch Tijdschrift* (1884, pp. 289 ff.); Ed. Meyer, *Die Israeliten und ihre Nachbarstämme* (1906, pp. 92 ff.); N. Schmidt, "Jerahmeel and the Negeb" in the *Hibbert Journal* (1908, pp. 339 ff.).

AARON. A villainous Moor in the Shakespearean play of *Titus Andronicus*. The resemblance of Aaron's brazen avowal of his wickedness in the last act of this play to a similar passage in Marlowe's *Jew of Malta* has been cited as an indication that the *Titus Andronicus* may possibly owe its origin to the same author.

AARON BEN ELIJAH. Distinguished Karaite theologian. He was born in Cairo c. 1300, lived for a long time at Nicomedia, in Asia Minor, and died in Constantinople in 1369. He was called Aaron the Younger to distinguish him from Aaron ben Joseph (q.v.). He is perhaps the most profound thinker among the Karaites (q.v.) and has often been compared with Maimonides. He was under the influence of the Mutazilites (q.v.). Like them, he held that all knowledge necessary for salvation emanates from reason and accepted an atomistic theory of the universe which recognized, however, a divine creation of the atoms. He looked upon Abraham as having developed through his own meditation a natural religion, afterwards systematized by Moses. He wrote *'Ez ha-Hayyim*, 'The Tree of Life,' in 1346; *Gan 'Eden*, 'The Garden of Eden,' a Karaite code, in 1354, and *Keter Torah*, 'Crown of the Law,' a commentary on the Pentateuch, in 1362. See Wolf, *Bibliotheca Hebraea* (i, 1715, pp. 114 ff.); Fürst, *Geschichte des Karäertums* (1862-69); Schreiner, *Der Kalam in der jüdischen Literatur* (1895, pp. 57 ff.).

AARON, BEN JOSEPH (c.1260-c.1320). Karaite teacher, physician, and poet. He is often called The Elder to distinguish him from Aaron ben Elijah (q.v.). He was born in Sulchat, Crimea, but lived most of his life at Constantinople. Eager for knowledge, and remarkably free from prejudice, he studied the works of Ibn Ezra and Maimonides and en-

tered into friendly relations with Christians. His best known work is *Mibhar*, 'The Choice,' a commentary on the Pentateuch in which he expressed his philosophical views. He rejects the existence of demons as an absurdity; and he regards the human soul as in its functions dependent upon the brain, the blood, and the spinal cord. His Book of Hymns and Prayers, *Seder Tefillot*, became the standard prayer-book of the Karaites. In this book he introduced also hymns of Ibn Gabirol, Jehudah ha-Levi, and Ibn Ezra. The *Mibhar* was published with a commentary by Joseph Solomon ben Moses Yerushalmi, Koslov, 1835. See Fürst, *Geschichte des Karäertums*, 1862-69; Schreiner, *Der Kalam in der Jüdischen Literatur*, Berlin, 1895, p. 57.

AARSENS, or **AARSSENS**, är'sens, FRANS VAN (1572-1641). A Dutch diplomat. At 26 years of age he was sent to Paris as the agent of the States-General; later he became Ambassador for the United Provinces, and long represented his country at the French court, where he was highly regarded by Richelieu. He was also at different periods Ambassador to Venice, Germany, and England. Motley, who considered Aarsens one of the ablest diplomats of Europe, shows that he contributed largely to the unrighteous death of Barneveldt, 1619.

AASEN, a'sen, IVAR ANDREAS (1813-96). A Norwegian philologist. He was born at Söndmøre. He at first studied botany, but subsequently turned his attention to researches respecting the native dialects. Assisted by the government, he traversed nearly the whole of Norway, investigating popular speech, upon which he sought to base a national language that should be free from Danish influence. "Landsmaal," the artificial language which he formed, was widely adopted by his countrymen. An effort to have it recognized by the government as the official language of Norway (instead of the "Rigsmaal," or Dano-Norwegian) seemed in 1913 assured of success. (See NORWEGIAN LANGUAGE.) In 1848 he published *Det Norske Folkesprogs Grammatik*, and in 1850 added *Ordbog over det Norske Folkesprog*, enlarged under the title of *Norsk Ordbog* in 1873, and in 1856 *Norske Ordsprog*, a treatise on Norwegian proverbs (2d ed., 1881). Through his linguistic work he was the originator of the patriotic movement generally known as the "Maalstræv."

AASVOGEL, äs'fö-gel (South African Dutch for 'carrion-bird'). Any of several South African vultures.

AB, äb. The fifth month of the Jewish religious year, and the eleventh (in intercalary years the twelfth) of the Jewish civil year. The first day of Ab became a fast to commemorate the death of Aaron; but of far greater significance is the ninth, commemorated as a fast to mark the destruction of the first temple by Nebuchadnezzar, 586 B.C., and of the second temple by Titus, 70 A.D., though there is no evidence to show that the latter ever took place on that day of the month. Ab corresponds roughly to July-August of the common year.

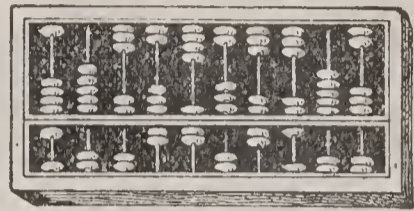
ABAB'DE. A Hamitic people west of the Red Sea, below Kosseir. Their habits are those of the desert, the camel being their chief domestic animal.

AB'ACA, ä'ba-kä. A term used in the Philippine Islands to designate the plant which produces manila hemp. See HEMP, MANILA.

ABACO, ä'bä-kö, or LUCAYA, GREAT and

LITTLE. Two of the Bahama Islands, the former 190 miles east of Florida, lat. 26° 30' N., long. 77° W. (Map: West Indies, J 1). Together they cover an area of about 879 square miles. Shipbuilding, wrecking, fishing, and the cultivation of sisal-fibre hemp are the chief employments. Many of the inhabitants are said to be descendants of American Tories. Pop., 1911, 4463.

AB'ACUS (Lat., from Gk. ἄβαξ, *abax*). A calculating machine or table occasionally employed in modern primary schools to make the elementary operations of arithmetic palpable. It consists of a frame with a number of parallel wires, on which beads or counters are strung. In ancient times it was used in practical



CHINESE ABACUS.

reckoning, and is thus used still in China, Persia, and elsewhere. The ancient Greek abacus consisted of a frame on which grooves were marked denoting the several orders, units, tens, etc. In these grooves counters were set to denote the units of each order. Across the grooves ran another, at right angles to them; counters set below this horizontal groove marked the units up to four, those above it denoted five or more units. Fractions were reckoned on a second set of grooves. In the *Abacus Pythagoricus* each counter bore a number, so that only one was needed in each column, and more complicated operations could be performed. The Roman abacus showed, at the bottom, nine perpendicular grooves. On the grooves to the right (grooves 8 and 9) fractions were reckoned, on the duodecimal system; in the other grooves units up to four were counted. Above the first eight grooves were eight shorter grooves, used for reckoning five or more units. (See CALCULATING MACHINES.)

Among the Romans the name *abacus* was given also to a tablet, with a rim about it, covered with sand, on which lines or figures were drawn with the fingers or some pointed instrument. This kind of abacus was used in school, in the study of arithmetic and geometry.

ABACUS. The flat member, usually square or octagonal, which forms the topmost feature of the capital of a pier or column. The edges of the abacus are usually molded, that of the Greek Doric order being the chief exception. In the Corinthian order and some variants of the Roman Ionic the sides are concave in plan and the corners slightly truncated. Gothic abaci are often octagonal; those of the English Gothic are quite as often circular. The term is also (rarely) applied to square tablets or panels in walls or mosaic floors. See CUR, p. 6.

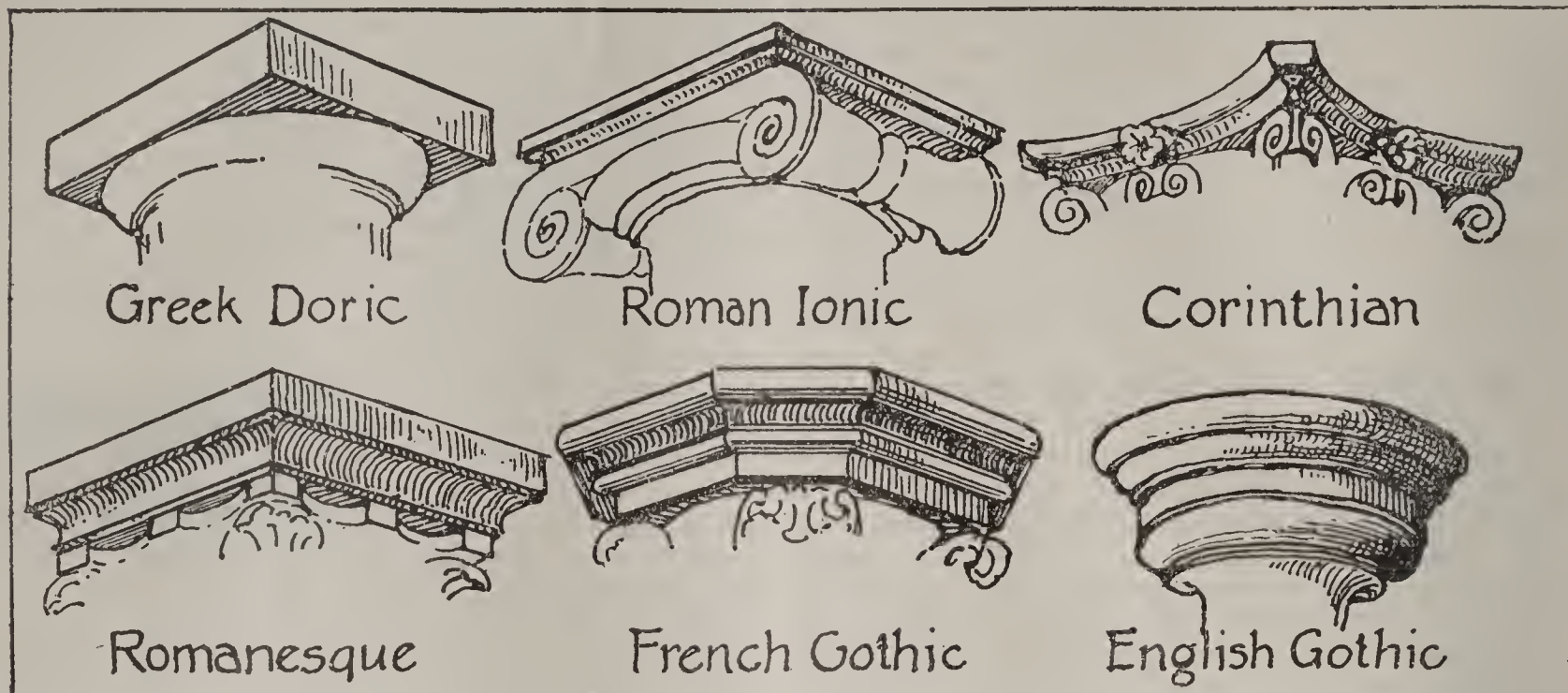
ABAD, ä-bäd' (Pers. and Hind., equivalent to the Engl. 'abode,' for which it is an obsolete form). An affix in the formation of many Oriental geographical names, especially in British India and Persia, as *Hyderabad* (Haidarabad), the 'dwelling' or city of Hyder.

ABADDON (a word peculiar to later Hebrew = 'ruin,' 'destruction'). In the Old Testament one of the names given to Sheol, or rather to the place of the lost in Sheol (Job xxvi. 6; xxviii. 22; xxxi. 12; Prov. xv. 11; Ps. lxxxviii. 11; also Wis. xviii. 22, 25, in some of which passages it is practically personified). Only once used in the New Testament (Rev. ix. 11),

and then as the proper Hebrew name of the King of the Abyss, whose Greek name is Apollyon ('Destroyer'). See APOCALYPTIC NUMBER.

ABAKA KHAN, ä-bä'ká hän' or kän'. See MONGOL DYNASTIES.

hending two very different conceptions: (a) the relinquishment or surrender of a legal right; (b) the willful renunciation of certain classes of legal obligations. Though commonly employed by law writers in the former sense, it is doubt-



ABACUS — TYPICAL FORMS.

ABAKANSK, ä'bä-känsk'. A fortified village in the government of Yeniseisk, Siberia, on the Abakan, near its junction with the Yenisei River (Map: Asia, J 3). It was founded by Peter the Great in 1707, and is situated in a very fertile region in the vicinity of coal mines that give employment to many of its inhabitants. Fur trading is also carried on extensively. Pop., about 2000.

AB'ALO'NE (Sp., of unknown origin). A name in California for the several local species of marine gastropods (family Haliotidæ), otherwise known as ear-shells or sea-ears; representatives are numerous throughout the warmer seas of the world, except the western Atlantic. The shell, although having the shape of a shallow oval saucer, is really a widely flattened spiral, the apex of which is near one end, while the turned-over margin is the columella. (See illustrations on Plate of ABALONE, ETC.) The animal creeps about rocks near the shore, spreading a fringed mantle, and extending tentacles through the row of holes in its shell; it feeds upon seaweeds, and when quiet or alarmed withdraws all soft parts beneath the shield-like shell and sits down with great tenacity, after the manner of its near relatives, the limpets. The lining of the shell is a layer of richly colored mother-of-pearl, much used for inlaying and for the manufacture of small ornaments, buttons, etc. The animals are eaten, especially by Orientals, and great quantities of them are collected and dried on the coast of California, not only for consumption by the local Chinese, but for export to China and Japan. A species in the Channel Islands, England, is regularly collected for food and is called *ormer*.

ABANCAY, ä'bän-kī'. The chief city of the department of Apurimac, Peru, 50 miles west-southwest of Cuzco, on the Abancay (Map: Peru, C 6). It possesses extensive sugar refineries and is the centre of the best sugar-growing district in Peru. There are several gold and silver mines in the neighborhood. Pop., 1896, 1200; 1912 estimate, 3000.

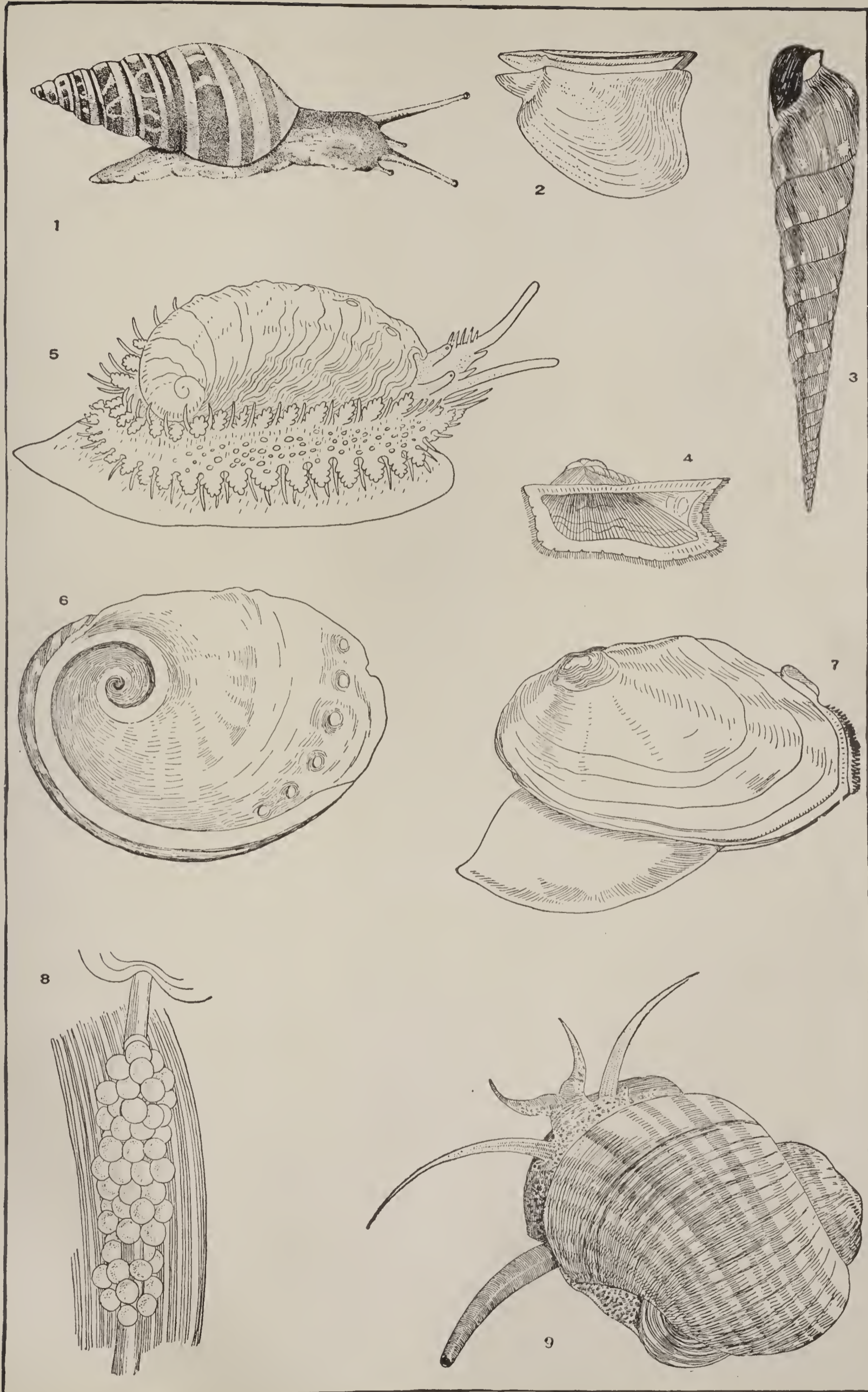
ABAN'DONMENT. A legal term compre-

ful if there is, strictly speaking, any such thing as the loss of a property right by mere abandonment. The cases which seem to support such a view usually, if not always, involve other considerations, such as a gift, an estoppel, or the operation of the Statute of Limitations. In criminal law abandonment is the intentional exposure or desertion of a dependent person by one who is under a legal duty of protecting and maintaining him. A parent or a guardian of the person of a young child is guilty of a misdemeanor at common law if the child is physically injured in consequence of the abandonment; while, if death results therefrom, the abandoning parent or guardian is guilty of murder. Even where no injury follows, abandonment of an infant is now generally punishable as a misdemeanor by statute. At present the offense is generally defined by statute. In some States it has been extended to the abandonment of a disabled or infirm animal in a public place. Consult: Wharton, *Criminal Law* (Philadelphia, 1896); Bishop, *Commentaries on Criminal Law* (Boston, 1895); Wharton, *A Treatise on Criminal Law* (San Francisco, Cal., 1912). See EASEMENT; ESTOPPEL; GIFT; INSURANCE; LIMITATION OF ACTIONS; PATENTS.

ABANO, ä'bä-nō, PIETRO D', also known as PETRUS DE APOÑO or APONENIS (1250-1316). An Italian physician and astrologer, professor of medicine in Padua. He became famous through his work, *Conciliator Differentiarum, quæ inter Philosophos et Medicos Versantur* (Mantua, 1472), the object of which was to reconcile the philosophy and medicine of the time. His fame as a scientist and his enormous popularity as a physician aroused the envy of less successful men. Charges of heresy and atheism were brought against him, and he was arraigned before the Inquisition. He was acquitted in the first trial, but died in prison before the end of the second.

ABANO BAGNI, a-bä-nō bä-nyè. A small watering place in the province of Padua, Italy, 29 miles by rail from Venice. It is famous for its hot sulphur springs, the water of which is

ABALONE, ETC.



1. AGATE SHELL (*Achatina*), with animal extended.
 2. WING SHELL (*Avicula*).
 3. AUGER SHELL (*Terebra*).
 4. ARK SHELL (*Arca*).

5. ABALONE (*Haliotis*), with animal extended.
 6. ABALONE (Interior), showing flattened spine.
 7. ANODON, a River Mussel, with foot extended.
 8. EGGS OF APPLESNAIL.
 9. APPLESNAIL (*Ampullaria*), with animal extended.

cooled in mud basins. They are much resorted to for diseases of the skin. The town was known in Roman times as Fons Aponi or Aquæ Patavinæ. The Monastery of St. Daniel is near by. Pop., 1901, 4550; 1911, 5450.

ABARBANEL, ä-bär'ba-něl'. See ABRABANEL.

AB'ARIM. The name signifying 'those on the other side' and applied to a range of mountains in the land of Moab, east of the Jordan and the Dead Sea (Num. xxvii. 12; xxxiii. 44, 47). Among these uplands was Mount Nebo, the place where Moses is said to have died (Deut. xxxii. 49). There are traces of an earlier use of the term to indicate the territory of Gilead as well as Moab, as in Jer. xxii. 20, where it is ranged with Lebanon and Bashan.

AB'ARIS (Gk. Ἀβάρης). A legendary hyperborean miracle-worker, possessor of a magic arrow of Apollo, on which he could ride through the air. His story probably originated in the mystical movements of the sixth century B.C., though Abaris is first mentioned by Pindar and Herodotus. The New Platonists elaborated the legend and made Abaris a companion of Pythagoras.

ABASCAL, ä'bäs-käl', JOSÉ FERNANDO (1743-1821). A Spanish statesman and general. He entered the army in 1762; became Governor of Cuba in 1796; was Viceroy of Peru from 1804 to 1816; in 1816 he was made Marqués de la Concordia. He was noted for administrative ability, firmness, and moderation.

ABASIA, ä-bä'së-ä. See ABKHASIA.

ABASOLO, ä'bä-söl'ö, MARIANO (1780?-1819). A Mexican revolutionist, born at Dolores, Guanajuato. He participated in the revolution started by Hidalgo in 1810 and rose to be a major-general. He fought at Puente de Calderón, was taken prisoner by the Spaniards, was tried at Chihuahua, and was sentenced to ten years' imprisonment at Cadiz, where he died.

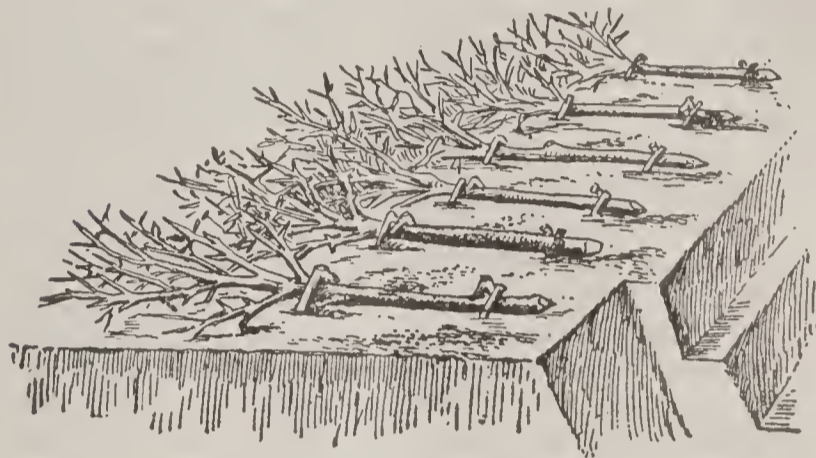
ABATEMENT (OF. lessening, from Lat. *a*, away + *batuere*, to beat). A term used in various senses in the common law of England and the United States, as follows: (1) *Abatement of Freehold*. The unlawful entry upon and taking possession of an estate of inheritance by a stranger after the death of the ancestor and before the heir or devisee has become seized of the estate by entry. (See FREEHOLD; SEISIN.) (2) *Abatement of Nuisances*. A remedy against injury by nuisance by removal of the nuisance. (See NUISANCE.) (3) *Plea in Abatement*. A pleading interposed by the defendant to the plaintiff's complaint or declaration by which the defendant, on some formal and technical ground, seeks to abate or quash the action. If sustained, it does not determine the merits of the controversy, but requires the plaintiff to begin his action anew. (See ACTION; PLEADING.) (4) *Abatement of Legacies*. A reduction of the amount of legacies when the estate of the testator is insufficient to pay debts and legacies in full. (See LEGACY.) (5) *Abatement of Suit*. Suspension of proceedings in a suit in Chancery for want of proper parties to proceed with the suit. Abatement may result from the death, change of interest of a party, or marriage of the plaintiff, if a woman. After abatement the suit may be revived and proceeded with by the legal representative of the deceased party, or by the husband of the plaintiff, if a woman. Action at law when abated could not be revived as in equity. This, however, is now permitted

by statute. (See ACTION.) (6) *Abatement* or discount in commercial law. (See DISCOUNT.) (7) *Abatement* or deduction of duties levied by the custom-house. (See CUSTOMS DUTIES; DRAWBACK.) (8) Abatement or reduction of taxes is regulated wholly by statute. See TAX.

ABATEMENT. IN HERALDRY. Any addition to the coat-armor of a knight or gentleman that was made to indicate an unknighthly deed on the part of the bearer was termed an abatement, and the arms so altered were said to be abated.

ABATI, ä-bä'tê, NICCOLO DELL'. See ABBATE.

AB'ATIS (Fr. *abatis*, mass of crushed objects). A military defense, used for the purpose of retarding an enemy's advance. It is a device as old as the art of war itself, and still used under certain conditions, or in positions where



ABATIS.

wire entanglements are neither possible nor available. It consists of trees felled and placed side by side, the stronger boughs and branches intertwined, and pointed in the direction of the enemy. Leaves and small twigs should be removed and the stiff ends of branches pointed. In the case of intrenchments of a more permanent character, the abatis is built in a slight depression in front of the trench or ditch, so that it is fairly safe from artillery fire.

ABATTOIR, ä'ba'twär' (Fr. *abattre*, to beat down, this referring to the method of slaughtering cattle). As popularly regarded, the establishments in which animals are slaughtered for food are divided into large abattoirs and local slaughter-houses. The former are usually operated in cities in connection with packing houses, while the latter are chiefly found in country towns, and their products are sold in a fresh condition principally for local consumption.

The abattoir system of the United States is of comparatively recent origin, but with the concentration of the meat industry in large establishments it has developed rapidly and assumed enormous proportions. The packing house, of which the abattoir is an important part, has become the great source of meat for domestic consumption and for the export trade.

As a result of investigations of the methods followed in these establishments in the preparation of fresh meats and canned goods, which revealed unwholesome and unhealthy practices, unsanitary conditions, and the inadequacy of government inspection under existing laws, Congress passed, on June 30, 1906, a comprehensive law for the inspection of all meats intended for interstate or foreign trade and of all establishments producing the same, and providing an appropriation of \$3,000,000 per annum to maintain this federal supervision. An additional appropriation of \$200,000 was made in 1913 for

the ensuing year. In 1912 federal inspection was conducted at 940 establishments located in 259 cities and towns. It is estimated that this reached about 60 per cent of the total meat supply of the United States, the remainder being under the jurisdiction of state and local officers.

The largest abattoirs and the principal centres for meat packing are at Chicago, Kansas City, Omaha, St. Louis, Cincinnati, Milwaukee, and Fort Worth. The Union Stock Yards in Chicago is the largest meat-packing centre in the world, covering an area of about 500 acres and representing an invested capital of \$67,000,000. It is an aggregation of abattoirs, packing houses, and other establishments for handling live stock and utilizing the products. During the year 1912 there were received 7,180,967 hogs, 2,652,342 cattle, 505,401 calves, and 6,055,546 sheep, of which 78 per cent of the hogs, 63 per cent of the cattle, 95.5 per cent of the calves, and 81 per cent of the sheep were slaughtered, the remaining animals having been shipped to other points for Eastern slaughter, export, feeding, or breeding purposes.

At the Chicago Stock Yards the animals are received in cars direct from the feeding country. They are unloaded, fed, watered, and sold to the expert buyers employed by the packing companies. They are then subjected to an ante-mortem examination by the government inspectors, and those showing any diseased or unsound condition are slaughtered separately and rejected if found diseased.

In the slaughtering of animals the division of labor is carried out to a very fine degree, which renders possible the greatest skill and speed in the work. The cattle are driven up to the pens on the killing floor, situated several stories above the ground, and stunned by being "knocked" between and above the eyes with a sledge hammer. The animal then rolls out on the killing bed, is shackled, hoisted on the rails of a suspended tramway, and bled by a "sticker." After bleeding, it is moved along to a place where the "header" skins and removes the head. The animal is now lowered from the tramway and skinned, a constant string of butchers following one after another in completing the work and trimming out the dressed carcass. In the larger abattoirs there are from 16 to 32 beds. These beds are the portions of the killing floor opposite to each knocking pen, on which the animal is bled, eviscerated, and dressed. They are arranged in a continuous series, the first workmen starting out on the first bed and going down to the last, by which time the last workman has completed No. 1 carcass, which is then pushed back on the rail out of the way for the next run. In this manner a force of 50 butchers, 45 washers and trimmers, and 60 miscellaneous workers may kill and dress about 7 runs of cattle in an hour, which means an average of from 1100 to 2000 beef carcasses for a day of 10 hours.

During the slaughtering, the carcasses are inspected by the federal meat inspectors. These latter officials follow the "gutter" and inspect the viscera, carefully examining all suspicious indications of disease and loathsome conditions. In case lesions of a serious disease are found, or if the animals are emaciated, advanced in pregnancy, have recently given birth to young, or are immature, the carcass is marked with a tag bearing the letters "U. S. Inspected and Condemned" and is rendered into fertilizer, thus

protecting the public from the danger of ingesting unsound or diseased meat. Those carcasses which fail to reveal conditions which would render the meat unfit for food, are marked "U. S. Inspected and Passed."

With the hogs the process of slaughtering is necessarily somewhat different. In the large packing houses the animals are driven into the catch pens, a chain is passed around the hind leg and attached to one of a series of arms on a constantly moving so-called "Ferris Wheel" which elevates the pig and deposits it on an inclined rail where its weight carries it to the "sticker," who severs the large blood vessel in the neck. As soon as the animal is dead it is placed into the scalding tank, through which it passes by a revolving motion and at the opposite end is lifted out by a cradle and drawn through the automatic scraping machine, which removes most of the bristles. The scraping is completed by hand on the scraping bench, after which the head is almost completely severed from the body. It is at this point that the first government inspector examines the cervical glands of every animal. The carcass is then hung on the track of a suspended tramway and here eviscerated, during which process it is inspected by a second inspector. The carcasses are then passed along the rail through the shower bath into the cooling room, but in cases where lesions are observed, the viscera together with the carcasses are tagged and switched to a special rail. The ultimate disposition of all carcasses is determined upon a final examination made by a third inspector.

The killing and dressing of the animals, however, is but a small percentage of the work done in the abattoir. There are large cutting rooms where the carcasses go from the cooling room to be cut into the various pieces, also curing and smoking rooms for the treatment of these cuts of meats. The making of leaf and steam lard and sausage manufacturing are large industries of themselves. See MEAT; PACKING INDUSTRY; and SLAUGHTER HOUSES.

ABAUZIT, *â'bô'zê'*, FIRMIN (1679-1767). A distinguished French archæologist, historian, and theologian, born at Uzès in Languedoc. Being of Huguenot ancestry and himself a Protestant, when the Edict of Nantes was revoked, he repaired to Geneva, which was then one of the great centres of Protestantism, and where he studied assiduously, so that he became one of those encyclopædic scholars who were typical of the seventeenth century before intense specialization was yet known. Eager to see all the Protestant world, in 1698 he visited both Holland and England. In the latter country he was an associate of Sir Isaac Newton, who acknowledged his own indebtedness to Abauzit for his correction of some errors in Newton's most abstruse mathematical work. Although King William III invited him to make his permanent residence in England, he persisted in returning to Geneva (1715), where he helped the translators in their task of rendering the New Testament into French (1726). His best known historical work was local, and consisted of profound research into the early history of Geneva. This led the authorities of that city to confer upon him all the rights of citizenship. During the remainder of his life he busied himself in the production of theological and archæological monographs. Though he passed for an orthodox Protestant, his actual belief was much disputed

after his death; but this question can never be determined, owing to a curious fact. His heirs, without giving any reason, destroyed all his theological papers which would have thrown light upon the inner workings of his mind. It is known, however, that he did deny to the Apocalypse a place among the accepted canonical writings. Abauzit numbered among his friends some very brilliant writers of his time, the list including not only Newton, but Bayle, Basnage, Voltaire, and J. J. Rousseau. This last-named eccentric genius, who was always chary in bestowing praise upon contemporaries, made Abauzit the subject of a fervid eulogy when writing *La Nouvelle Héloïse*. Abauzit died at Geneva.

AB'BA (Gk. ἀββᾶ). The Aramaic word for 'father.' It occurs three times in the New Testament as a form of address to the Deity (Mark xiv. 36; Rom. viii. 15; Gal. iv. 6). In all these instances its meaning in Greek is added, for the benefit of readers unfamiliar with Aramaic. In Talmudic literature it occurs frequently as a title of honor addressed to a scholar, and also enters into the composition of proper names. The title Abba is frequently met with in ecclesiastical literature and is applied to the bishops of the Syriac, Coptic, and Ethiopic churches.

ABBA ARIKA, ā-rē'kā. A famous Jewish scholar in Babylonia and founder of the academy of Sura. He is usually called Rab. He was the descendant of a distinguished Babylonian family, studied at Sepphoris, and having been ordained there, returned to Babylonia, where he settled first at Nekardea, and then at Sura. His general attitude is best expressed in this utterance: "The commandments of the Law were only given to purify men's morals." He exercised a profound influence on Jewish life and thought. See Muhlfelder, *Rab, ein Lebensbild* (1871); Bacher, *Agada der Babylonischen Amoräer* (1878, p. 1).

ABBADIDES, a-bād'idz or -īdz. An eleventh century Mohammedan dynasty in Spain. The founder was Abd-al-Kasim Mohammed, the very wealthy kadi of Seville, in 1023. Before 1042, when he died, he had made himself recognized as the leader of the Moslems of Arabic or Spanish descent against the Berbers, whose chief was the King of Granada. His son Abbad, surnamed El Motaddid (1042-68), and his grandson, surnamed El Motamid (1068-91), successively held his position and were very remarkable men. Like the later Renaissance tyrants in Italy, they were cruel and licentious, but also noted for their love of literature and culture. Many interesting tales are told of them and their favorites: e.g., of El Motaddid's collection of the skulls of his enemies whom he had killed; or of the caprices of Romaica, the slave girl whom El Motamid married; but especially of the beautiful Zaida, the daughter of El Motamid, whom the latter handed over to Alphonso VI of Castile as a concubine. The misrule and cruelties of the Abbadides led to great dissatisfaction, and the position of El Motamid became so desperate after the capture of Toledo by Alphonso VI, in 1085, that he called in the Almoravides (q.v.). He soon came to open breach with them, but by alternately or simultaneously intriguing with them or with Alphonso he tried to save himself. His efforts failed; Seville was captured in 1091; he was made a prisoner and died in prison in 1095. See Dozy, *Histoire des Musulmans d'Espagne* (Leyden, 1861), and id., *Historia Abbadidarum* (Leyden, 1846).

ABBADIE, dá'bá'dē', ANTOINE THOMSON D' (1810-97); and ARNAUD MICHEL D' (1815-93). Two French explorers, brothers, born in Dublin. They were known for their researches in Abyssinia from 1837 to 1848. According to their own account, their objects were purely ethnological and geographical; but they were regarded by certain English travelers and missionaries as agents employed by the French government for religious and political purposes. Antoine became involved in controversies, and the accuracy of his facts was disputed, but later his reports of geographical discoveries were proved substantially accurate. Among the results of their travels were a catalogue of Ethiopic MSS., an edition of the Ethiopic version of the *Pastor of Hermas*, and the *Géodésie de la Haute-Ethiopie* (1860-73). The English expedition to Abyssinia led Arnaud to publish, in 1868, his *Douze ans dans la Haute-Ethiopie*. Antoine published a *Dictionnaire de la langue Amarinna* in 1881.

ABBADIE, JACQUES (1654?-1727). A French Protestant theologian, who died in London. Of a poor family, he was educated by his friends and advanced so rapidly that at seventeen he was granted the degree of doctor of theology at Sedan. He spent several years in Berlin as minister of the French Protestant church and in 1688 accompanied Marshal Schomberg to England, becoming minister of the French church in London called "La Savoye." He was strongly attached to the cause of William III, who made him dean of Killaloe, Ireland. He wrote a defense of the English revolution of 1688, but was best known by his theological works, the most important of which was *Traité de la vérité de la religion chrétienne* (1684).

ABBAS I, äb'bäs (1557-1628). Shah of Persia; known as "the Great." He was the youngest son of Shah Mohammed Khodabendeh. He rose in rebellion against his father and gained possession of the throne at the age of eighteen. In 1597 he defeated the Uzbeks in a great battle near Herat and drove them from the country. During many campaigns against the Turks he added a great deal of territory to his possessions. He overthrew the Turks and Tatars near Sultanieh and extorted an advantageous peace from them (1618). Upon the renewal of hostilities he captured Bagdad after a year's siege, in 1623. In a fit of Oriental jealousy Abbas killed one of his sons and put out the eyes of two others. He did, however, despite his tyrannical nature, introduce many reforms into his country. See PERSIA.

ABBAS I, PASHA, äb'bäs pá-shä' (1813-54). Viceroy of Egypt and grandson of Mehemet Ali. He was active but not distinguished in Mehemet's wars in Syria. After Ibrahim's short reign he took the throne (1848) as hereditary successor and proved a cruel and capricious ruler. He dismissed all Europeans from state service and in general was a foe to civilization. In the Crimean War he assisted the Sultan of Turkey with his fleet and 15,000 men. It is supposed that he was murdered.

ABBAS II, HILMI (1874-). Khedive of Egypt; eldest son of Tewfik Pasha. He was educated at Vienna, and succeeded his father in 1892. Though holding an unfriendly attitude toward English interests in Egypt, he carried on his government under British supervision following an abortive attempt in 1893 to form an anti-British cabinet. He made an official visit to England in 1899. See EGYPT.

ABBAS IBN ABD AL MUTTALIB, äb'bas 'b'n äbd' èl mōōt-tä'lëb (566-652). Paternal uncle of Mohammed. He was at first a determined opponent of his nephew, but his defeat in battle at Bedr was followed by his conversion, after which he became one of the chief apostles of Islamism. He was the progenitor of the Abbaside caliphs of Bagdad.

ABBASIDES, a-bäs'idz or -idz, THE (Ar. al-'Abbasiyah). Caliphs of Bagdad, and the most celebrated Muslim dynasty, although their rule never extended over the whole of Islam, as had that of the Umayyads. In Spain it was acknowledged only for a few years before the establishment of Abd al Rahman's power and nominally by the Almoravides (1086-1149). After 788 in Fez, and 800 in Kairawan, it was chiefly the spiritual authority of the Abbaside caliph that was recognized in N. W. Africa, until even this was refused by the Almohades (1147-1269) who, like the Umayyads in Cordova (756-1031), assumed the title of caliph. The Abbasides claimed descent from Abbas, the uncle and adviser of Mohammed (566-652). The rivalry between the family of Abbas and the Umayyads led to open rebellion in Khorasan in 747. Ibrahim, the head of the Abbaside faction, defeated the Caliph Marwan II in June, 747. He was indeed taken captive by Marwan in 748; but his brother Abu'l Abbas (q.v.) was proclaimed caliph in 749 and in 750 defeated Marwan in a great battle near the river Zab and established his line firmly on the throne. Abu'l Abbas mercilessly put to death all whom he could find of the family reigning in Damascus and gave himself the surname *al Saffah*, 'the shedder of blood.' In Spain, however, Abd al Rahman, one of the Umayyads who had escaped, succeeded in establishing the great independent amirate, or kingdom (subsequently caliphate), of Cordova. The successor of Abu'l Abbas (750-754), Almansur (754-775), made Bagdad the capital of his empire. Under his followers the empire enjoyed comparative peace and attained to a splendid development. The caliphs became the patrons of literature, art, and learning, and their courts were the home of the most extreme luxury. The caliphs Harun al Rashid (786-809) and al Mamun (813-833) were famous throughout the world for their wealth, their splendor, and their munificence. But the martial vigor of the Arabs was sapped by the influence of Persian luxury, and they gradually ceased to be relied upon for military service. In Africa and in the northeastern part of Persia amirs seized the opportunity to declare themselves independent; in the West the Greek Empire showed a revival of energy; but the real danger came, as with the Roman Empire, from an alien soldiery. Al Mutasim (833-842) had formed a body-guard of Turks, and these in time seized upon the real powers of government. They assassinated al Mutawakkil, the son of al Mutasim, in 861, and in 908 forced al Muk-tadir to delegate the chief powers of government to their commander under the title *amir al umara*. In 945 the caliphs came under the power of the Buwayyid dynasty of amirs in Bagdad; and in 1055 these were succeeded by the Seljuks (q.v.). On the decline of their power the caliphs were able for some time to maintain themselves in Bagdad or the surrounding territory. But in 1258 Hulagu Khan, the Mongol ruler of Persia, burned Bagdad and put the ruling caliph al Mustasim to death. Some of the Abbasides fled

to Egypt, and one of their number was proclaimed by the Mamluk ruler as caliph in Cairo under the name of al Mustansir. His successors continued to enjoy a kind of priestly dignity, investing the Sultans of Egypt with their power. When Selim I conquered Egypt in 1517, he took with him the last of these caliphs, al Mutawakkil II, and allowed this dignitary to invest him with the spiritual as well as the temporal power of the caliphate. He died in 1538 at Cairo. Consult: Muir, *The Caliphate* (3d ed., 1899); Weil, *Geschichte der Chalifen* (Mannheim and Stuttgart, 1846-62); Müller, *Der Islam im Morgen- und Algadland* (1887); Van Vloten, *De opkomst der Abbasiden in Chorasán* (1888).

ABBAS MIRZA, äb'bas mërza (1783-1833). A Persian prince who attained considerable prominence by defending his country against Russia. Aided by English officers, he inaugurated, as a young man, many reforms in the Persian army and waged two unsuccessful wars against Russia. As a result of the first, Persia was forced to cede all of her territory in the Caucasus; as a result of the second, although further territory was lost, Abbas Mirza was recognized as the successor to the Persian throne. The Prince traveled in later years to St. Petersburg and was welcomed heartily by the Czar; he won a reputation for moderation and enlightenment and was a patron of literature. In 1834 his eldest son, Mohammed Mirza, became ruler of Persia. See PERSIA.

ABBATE, äb-bä'tä, NICCOLO DELL' (c.1512-71). The forms Abati, Abbati, and Abbé (French) also occur. An Italian decorative painter and designer. He was born at Modena, studied with his father, a fresco painter, and with the sculptor Begarelli, but was most influenced by the works of Correggio. His early frescoes at Modena are, for the most part, lost, and of those at Bologna but few survive. In 1552 or shortly before, he removed to France, where the remainder of his life was spent. He was Primaticcio's chief assistant in decorating the palace at Fontainebleau, after that master's as well as his own designs. Abbate thus became a follower of Primaticcio (q.v.), whose style he was chiefly instrumental in spreading, particularly through his designs for the decorative arts, which were used as models in other European countries.

ABBAZIA, ä'bä-tsé'ä. An Austrian health resort, charmingly situated at the head of the Gulf of Quarnero (Adriatic Sea), 9 miles west-northwest of Fiume (Map: Austria, D 4). Well sheltered, Abbazia is a favorite summer and winter resort, with a mean temperature of 50° F. in winter and 77° F. in summer. Over 40,000 visitors frequent this retreat annually, among whom are many yachtsmen. It has a new Palast, various bathing institutions, and the Carol Promenade, built in 1896 at the expense of the King of Rumania. The population is about 2500, mostly Croats.

ABBE, ä'bä'. The French name for an abbot (q.v.), but often used in the general sense of an unbeneficed Roman Catholic priest. By the famous Concordat of Bologna between Pope Leo X and Francis I (Aug. 18, 1516), the French King had the right to nominate upward of 200 *abbés commendataires*, who, although without duty, drew an income from the convents. Later it came to be used in France of clerics not in sacred orders, who were tutors or companions in the families of the nobility. In Italy the

same class of unbeneficed clergy are called *abbate*.

ABBE, CLEVELAND (1838–1916). An American astronomer, meteorologist, and educator, born in New York City. He graduated in 1857 at the Free Academy (now the College of the City of New York) and studied astronomy with F. Brünnow at Ann Arbor (1858–60) and with B. A. Gould at Cambridge (1860–64). From 1864 to 1866 he resided at the observatory at Pulkova, Russia, and from 1868 to 1873 was director of the Cincinnati Observatory, where he inaugurated a system of daily weather forecasts based upon simultaneous meteorological observations reported by telegraph. This led to the establishment of a similar system by the government. In December, 1870, Professor Abbe was called to Washington to prepare the official weather predictions and storm warnings, and in 1891 he was appointed meteorologist of the Weather Bureau. To him is due the initiation, in May, 1879, of the movement toward the introduction of the now universal systems of standard time and hourly meridians. In January, 1873, he prepared the first official *Monthly Weather Review*, which continued under his editorship until July, 1909, after which he became editor of the *Bulletin* of Mt. Weather Research Observatory. He is lecturer on meteorology in Johns Hopkins University, Baltimore, and a member of the National Academy of Sciences. He received the degree of LL.D. from the University of Michigan in 1887 and from the University of Glasgow in 1896. The Royal Meteorological Society of Great Britain conferred upon him the Symons Gold Medal in January, 1912. Among his publications are: *Annual Summary and Review of Progress in Meteorology* (1873–88); *Treatise on Meteorological Apparatus and Methods* (1887); *Preliminary Studies for Storm and Weather Predictions* (1889); *The Mechanics of the Earth's Atmosphere* (1891); *Physical Basis of Long Range Forecastings* (1902); *Relations between Climates and Crops* (1905); *Mechanics of the Earth's Atmosphere* (3d coll. 1911).

ABBE, CLEVELAND, JR. (1872—). An American geographer, son of Cleveland Abbe (q.v.). He was born in Washington, D. C., and graduated from Harvard University in 1894. He took post-graduate studies at Johns Hopkins University, receiving the Ph.D. degree in 1898. From 1901 to 1903 he studied geography at the Imperial University, Vienna. He was appointed instructor in physiography at the Corcoran Scientific School of Columbian (now George Washington) University in 1894 and remained in that position until 1897. In 1896–1901 he was an assistant in the Maryland Geological Survey, part of the time also filling the chair of geology and biology in the Western Maryland College. In 1899 he became acting professor of the natural sciences in the Winthrop Normal and Industrial College in South Carolina. He held this position until 1901. Two years later he was appointed aid in the United States Geological Survey, and in 1906 research observer in the United States Weather Bureau. From 1908 to 1910 he was assistant editor of the *Monthly Weather Review*, and in the latter year became assistant in the library of the United States Weather Bureau.

ABBE, äb'be, ERNST (1840–1905). A German physicist. He was born at Eisenach, Thuringia; studied at Jena and Göttingen; became assistant at the astronomical observatory in Göt-

tingen and lecturer before the Physical Society of Frankfort-on-the-Main. In 1870 he was made professor at Jena; in 1878 became director of the astronomical and meteorological observatories, but resigned his ordinary professorial duties in 1891, when he became sole proprietor of the Carl Zeiss optical works in Jena, with which he had been connected since 1866. This he made a co-operative establishment, in the profits from which the officials, the workmen, and the university share. Abbe is well known for the part he played in the design and perfection of optical instruments. The high degree of excellence of the instruments and lenses manufactured by his firm is largely the result of his experimental work. Especially has the improvement been marked in photographic and microscopic lenses. He invented the Abbe refractometer and wrote many papers on optics and optical instruments. See his *Gesammelte Abhandlungen* (Jena, 1904).

ABBE, CONSTANTIN, L'. A story by Ludovic Halévy dealing with the distresses of the good Abbé Constantin when he learns that a neighboring estate has been bought by an American millionaire. He soon discovers, however, to his great joy, that Americans are not necessarily heathen. The book was first published in 1882, and in the next 30 years passed through more than 150 editions.

ABBE, TRUMAN (1873—). An American surgeon, son of Cleveland Abbe (q.v.), and brother of Cleveland Abbe, Jr. (q.v.). He was born in Washington, D. C., and graduated from Harvard University in 1895. He studied medicine at the College of Physicians and Surgeons (Columbia University), New York, receiving his degree in 1899. After post-graduate studies at the University of Berlin in 1899–1900, he served in several hospitals in New York City. In 1902 he was appointed instructor in physics and physiology at Georgetown University, and in 1903 assumed also the duties of instructor in surgery. In 1905 he was appointed instructor in physiology at George Washington University, and four years later instructor in surgery at that institution. He was surgeon in charge of the Garfield Surgical Dispensary from 1906 to 1910. Important researches into the use of radium as applied to medicine brought him a silver medal at the Jamestown Exposition in 1907. He contributed to vol. iii of Wharton and Stiller's *Medical Jurisprudence* in 1905, collaborated with F. H. Bowlby on *Physical Conditions and Treatment*, and wrote many articles on radium and medical subjects for medical journals.

AB'BESS. The superior of a religious community of women, who corresponds in rank and authority to an abbot (q.v.), except that she is not allowed to exercise the spiritual functions of the priesthood—such as preaching, confession, etc. Nor can she release her nuns from their vows or suspend or dismiss them. Her personal confessor and those for her nunnery must be approved by the bishop. The Council of Trent decreed that her electors must be professed nuns and that she must be at least forty years old and an inmate of the nunnery over which she was to preside for at least the eight previous years. The term was in occasional use from early times, but it became the official title of the superiors of Benedictine nunneries, whence it spread in course of time to other orders.

ABBEVILLE, äb'vel' (Fr., 'city of the Abbey,' of St. Riquier). Capital of the arrondissement of Abbeville, in the department of

Somme, France, 28 miles by rail northwest of Amiens (Map: France, N., G 2). Abbeville is built partly on an island and partly on the banks of the river Somme. It is connected with the sea by means of a canal. The streets are narrow, and the picturesque houses are built mostly of brick and wood. The building most worthy of notice is the church of St. Wolfran, commenced in the reign of Louis XII, a splendid example of the flamboyant style. Its city hall, built in 1209, is a curious medieval structure; the library dates from 1690. The important industries of Abbeville centre around its cloth factories, which make velvets, serges, cottons, linens, sacking, hosiery, etc. It is on the Northern Railway, and is connected by canals with Amiens, Paris, Lille, and Belgium. Vessels of between 150 and 200 tons can sail up the Somme as far as Abbeville, which is 12 miles from that river's mouth in the British Channel. Abbeville is well known in the scientific world from the remarkable fossil remains of extinct mammals, as well as the flint implements of prehistoric man, which have been discovered in its neighborhood. Pop., 1896, 17,781; 1901, 20,388; 1906, 20,704; 1911, 20,373.

ABBEVILLE, äb'ë-vil. A town and the county seat of Vermilion parish, La., 150 miles southwest of New Orleans, on the Inter-Coastal Canal, the Vermilion River, and on the Iberia and Vermilion Railroad (Map: Louisiana, C 4). The town is the seat of the Fenwick Sanitarium, and has rice, sugar, and cotton factories. The Inter-Coastal Canal provides water for extensive irrigation work carried on by three companies. The water works and light plant are owned by the town. Pop., 1890, 637; 1900, 1536; 1910, 2907; 1913 (est.), 3500.

ABBEVILLE. A town and the county seat of Abbeville Co., S. C., 105 miles west of Columbia, on the Southern and Seaboard Air Line railroads (Map: South Carolina, B 2). The town contains railroad repair shops, and includes among its industries cotton-ginning, cotton-seed oil pressing, flour and feed milling, and the manufacture of cotton cloth and bricks. Abbeville owns its water works and electric light plant. Pop., 1900, 3766; 1910, 4459; 1913 (est.), 4700.

AB'BEY. See MONASTERY; SANCTUARY.

ABBEY, äb'ï, EDWIN AUSTIN (1852-1911). The foremost of American illustrators; also a distinguished figure and mural painter. He was born in Philadelphia, April 8, 1852. Descended from an artistic family, the lad grew up with brush and pencil. At the age of sixteen he was placed with a wood engraver and afterwards studied for a year in the Pennsylvania Academy of Fine Arts. In 1871 he entered the employ of Harper Brothers in New York, associated with Charles S. Reinhart, Howard Pyle, Joseph Pennell, and William T. Smedley. In 1878 he was sent by the firm to England to make studies for his illustrations of Herrick's *Poems*. They were followed by illustrations to Goldsmith's *She Stoops to Conquer* (1887), *Old Songs* (1889), *Who is Sylvia*, and the *Comedies* of Shakespeare. From 1881 he resided in Great Britain.

As a painter in water colors and pastel, Abbey has shown great ability. Among his best-known water colors are "The Evil Eye" (1887), "An Old Song" (1886), "Le Jongleur"; among his pastels, "Phyllis," "Two Noble Kinsmen." His first oil painting, "A May Morning," exhibited in 1890, met with immediate success. It was fol-

lowed by "Fiametta's Song" (1894), "Richard of Gloucester and the Lady Anne" (1896), "King Lear's Daughters" (1898), presented in 1913 to the Metropolitan Museum of Art, New York; "The Penance of Eleanor, Duchess of Gloucester" (1909), now in the Carnegie Institute Museum at Pittsburgh; "The Crusaders" (1901), "Columbus and the New World" (1906), and a reredos for the American church in Paris (1907). In 1901 he was commissioned to paint the "Coronation of Edward VII," which he completed with great success in 1904, but refused the same commission from George V. He was the third Pennsylvanian commissioned to paint a British coronation. The others were Benjamin West for George III and Charles Robert Leslie for Victoria.

But Abbey's greatest paintings were two great decorative series executed for his native land. The earliest of these, fifteen great canvases representing the "Quest of the Holy Grail" (1891-1902), adorns the book delivery room of the Boston Public Library. The effect of the bright and beautiful colors is, unfortunately, impaired by the position of the paintings. The last ten years of his life were devoted to mural paintings in the Pennsylvania State Capitol at Harrisburg, which show great progress over the previous work. The central dome of the building is adorned by four gigantic lunettes and four ceiling panels. Above the speaker's rostrum in the House of Representatives is the "Apotheosis of Pennsylvania," a canvas 34 feet square, representing famous men of that commonwealth, which ranks as his highest achievement in painting. It is flanked by "Penn's Treaty with the Indians" and by the "Reading of the Declaration of Independence," the latter completed by his pupils in 1913. The rotunda of the ceiling is adorned by a mystic and beautiful representation of the "Hours" of day and night. Of his paintings for the Senate Chamber only one, "Von Steuben Training the American Soldiers at Valley Forge," was completed. His unexpected death in London, Aug. 8, 1911, prevented the painter from finishing the rest.

Abbey ranks as one of the world's greatest illustrators. His marked predilection for the costume and life of the past and his historic and topographic accuracy fitted him peculiarly for the period he has chosen. An excellent draughtsman, he preserved a certain romantic attitude towards his subject, which never fails to charm. As a painter he ranks among the most intellectual and able that America has produced, and although his painting is illustrative, he excels especially in color. He received gold medals at Vienna, Paris, Berlin, Philadelphia, etc.; was a member of the National Academy of Design, New York, the Royal Academy, London; an honorary member of several European academies; Chevalier of the Legion of Honor and corresponding member of the Institute de France; and honorary LL.D. of the University of Pennsylvania. Consult: Abbey, *The Quest of the Holy Grail* (Boston, 1909) for the reproductions; a charming interpretation by Greenslet, same title (ib. 1902).

ABBEY, HENRY (1842-1911). An American poet and merchant, born at Rondout, N. Y. He is the author of *May Dreams*, *Ralph and Other Poems*, *Stories in Verse*, *Ballads of Good Deeds*, *The City of Success*, and *Phaëton*. His works are collected in *Poems of Henry Abbey*, of which there are three editions.

ABBEY, HENRY EUGENE (1848-96). An

American theatrical manager, born at Akron, Ohio. He began as manager of a local theatre, then conducted starring tours for Lotta and others, and in 1876 leased the Academy of Music in Buffalo. Success rapidly followed his removal to New York, where he became manager, first of the Park Theatre, later also of Booth's and the Grand Opera House. Theatres in Boston and Philadelphia, as well, came under his control. Upon his engagement of Sarah Bernhardt and her company in 1880 he became known as the "Napoleon of managers." In 1883-84 Abbey controlled the Metropolitan Opera House, and it was under his management that Adelina Patti, in 1889-90, made a tour of the United States. In 1893 he produced the brilliant spectacular play *America*, built Abbey's Theatre in New York, and resumed control of the Metropolitan.

ABBIATEGRASSO, ab-byä'tä-gräs'sò. A city in north Italy, 394 feet above the sea, on the Grande and Bereguardo canals, 16 miles west of Milan (Map: Italy, C 2). It manufactures fertilizers and markets rice. It was captured in 1167 by Emperor Frederic Barbarossa, and in 1245 by Emperor Frederick II. In 1313 Matteo Visconti vanquished the Guelphs here, and in 1524 Giovanni de' Medici defeated the French. Pop., 1901, 12,270; 1911, 13,168.

ABBITIBBI. See ABITIBI.

AB'BO, or **ABBON OF FLEURY**, flê'rè (ABBO FLORIANENSIS) (945?-1004). A French theologian. He studied at Rheims and Paris, and at the request of Oswald, Archbishop of York, taught in 985-987 in the English abbey of Ramsey. When he returned to France, he was chosen Abbot of Fleury, whose school he developed. He was sent by King Robert upon a diplomatic mission to Pope Gregory V and was killed at the priory of La Réole, Gascony, in an uprising against his reforms in monastic discipline. He wrote an *Epitome de Vitis Romanorum Pontificum, Desinens in Gregorio I* (printed in 1602). His biography was written by his pupil Aimoin in the *Vita Abbonis abbatis Floriacensis*.

AB'BOT (through Lat. *abbas*, Gk. ἀββᾶς, *abbas*, from Syriac *abbā*, father). See ABBE. In the early days of monasteries any monk who won the reverence of the people might be called abba. The term, first used in Syria, spread, and soon was applied to the head of a monastery. Other terms were used—elder, senior, and, in the Greek churches, archimandrite (head of the fold) and hegumenos (leader). The last two terms have survived in the Greek church to the exclusion of abbot. The rule of St. Benedict (c.529) fixed abbot or abbat, as the name of the superior of the monastery. The Benedictine conception is that each house is a home, and abbot is appropriate as the title of the head of the house. The name has been perpetuated by the Benedictines and the orders derived from them, as the Cistercians, Bernhardines, Trappists. Other orders use other terms. In early times the abbot was a layman, as were all monks. Later, convenience led to the ordination of a priest in the monastery, and the abbot was often the priest. In 826 a council decreed that abbots should be ordained, but even in the eleventh century some were only deacons. In the Middle Ages laymen sometimes held the office, often nominally as trustees of the estates of the abbey; but this custom led to great abuses. The mode of election varied in early

times. The earliest and always the most common method was election by the monks. Sometimes the bishop appointed him; occasionally the abbot chose his own successor. The rule of St. Benedict declared that the abbot should be elected by the monks. In the Middle Ages the wealth of the monasteries invited invasion of their rights by the civil authorities, and the prince often usurped the power of appointment. Among the reforms of the Council of Trent (q.v.) was the restoration to the monastery of the right of electing the abbot. The newly elected abbot must be confirmed by the bishop, or, if the house was exempt from his control, by the Pope. Exempt monasteries were rare, there being in England only five or six. The abbots of these had to go to Rome, either in person or by proxy, for confirmation. The cost of travel and fees was enormous, and later the journey to Rome was remitted for a yearly tax of 200 florins to the papal treasury. At present in the United States abbots are confirmed directly by the Pope; in England, by the abbot president, a superior elected by the abbots. The abbot is elected for life. His rule is absolute over the monastery, both as to its temporal estates and its spiritual activities. He himself, however, is under rules which were intended to curb undue ambition and to bind him to his duties in his house. As early as the seventh century certain abbots were granted the right to use pontifical insignia, including the mitre, the crosier, and the ring. There were three classes: mitred abbots; crosiered abbots, allowed by special permission of the Pope to bear a crosier or have it borne before them; œcumenical abbots, ruling the houses of a province or country. Abbots hold a rank immediately after bishops. Their mitres must be less costly than those of bishops, and they are allowed, not a permanent throne, but a temporary one. Abbots have usually sat with bishops in the councils of the Church. They appear in the Council of Constantinople (443), in that of Toledo (653), and in most later councils. In the third Plenary Council at Baltimore (1884) six abbots were present, two of whom had a decisive vote; the rest, a consultative voice. Before the Reformation certain abbots had seats in the English Parliament. In one Parliament in the time of Henry III there were 64 abbots; later Parliaments contained 26. At present there are 17 mitred abbots in the United States, 2 in Canada, 10 in England, 1 in Scotland, 2 in Ireland. See Feasey, *Monasticism* (London, 1898); Gasquet, *English Monastic Life* (London, 1904); Taunton, *The English Black Monks of St. Benedict* (London, 1898).

ABBOT, BENJAMIN, LL.D. (1762-1849). A New England teacher, educated at Phillips Academy and at Harvard College. For nearly 50 years (until 1838) he was at the head of Phillips Academy, Exeter, N. H. Among his pupils were Jared Sparks, Daniel Webster, George Bancroft, Edward Everett, and others who became famous.

ABBOT, CHARLES, first BARON COLCHESTER (1757-1829). A Speaker of the House of Commons. He was born at Abingdon and was educated at Christ Church. After he had occupied numerous positions under the government he became Speaker of the House (1802) and held the office until 1817, when ill health compelled him to retire. He was one of the ablest Speakers that ever occupied the chair, and also

rendered valuable services as a trustee of the British Museum. His valuable *Diary and Correspondence* was published by his son in 1861.

ABBOT, CHARLES GREELEY (1872—). An American astrophysicist, born in Wilton, N. H., and graduated from the Massachusetts Institute of Technology in 1894. In 1895 he was appointed assistant at the Smithsonian Astrophysical Observatory, and in the following year became aid, acting in charge. He was appointed acting director in 1907 and, in March of the same year, director. He devoted himself continuously to researches in solar radiation and with S. P. Langley completed and published the mapping of the infra-red solar spectrum. This is described in vol. i of the *Annals* of the Astrophysical Laboratory. He conducted expeditions to view the total solar eclipses of May 28, 1900, May 18, 1901, and Jan. 3, 1908. His later studies had chiefly to do with the total amount and variability of solar radiation, its absorption in the solar and terrestrial gaseous envelopes, and the effect of its variability on climate. Abbot became a member of many astronomical and other scientific societies. He wrote *The Sun* (1911) and numerous articles on the apparatus, methods, and results of solar research.

ABBOT, EZRA (1819–84). An American biblical scholar. He was born at Jackson, Waldo Co., Maine, and died at Cambridge, Mass. After graduation at Bowdoin College (1840) he taught school in Maine and in Cambridge, Mass., until in 1856 he became assistant librarian of Harvard University. From 1872 till his death he was Bussey Professor of New Testament Criticism and Interpretation in the Divinity School of Harvard University. He received the degrees of LL.D. (Yale, 1869; Bowdoin, 1878); S.T.D. (Harvard, 1872); D.D. (Edinburgh, 1884). His industry, classical scholarship, wide acquaintance with books, and rare capacity for retaining minute information made him a remarkable bibliographer and textual critic. He won fame in the first direction by his valuable *Literature of the Doctrine of the Future Life* (1864), appended to W. R. Alger's book on the subject, and by his bibliographical additions to *Smith's Bible Dictionary* (American ed., Boston, 1867–70, 4 vols.). But much wider was his fame in the second direction, for his acquaintance with the text of the Greek New Testament was recognized throughout the biblical world and placed him beside Lachmann, Tischendorf, Tregelles, Scrivener, Westcott, and Hort. He was therefore an efficient member of the American New Testament Revision Company (1878–81). Into the revision he put the most painstaking and accurate learning. He displayed his attainments in ways which won him the hearty thanks of the authors he aided, but not much public recognition. Thus he was the coadjutor of Caspar René Gregory upon his prolegomena to the eighth major edition of Tischendorf's Greek New Testament (Leipzig, 1884–94, 3 parts); he revised the whole of Schaff's *Companion to the New Testament* (New York, 1883) and greatly enriched E. C. Mitchell's *Critical Handbook of the New Testament* (New York, 1880). His modesty made him indifferent to fame, and he put his strength upon correcting other people's books and upon monographs which the scholarly world appreciated. These latter have been collected by J. H. Thayer, under the title *Critical Essays*

(Boston, 1888). Consult Barrows' sketch of *Ezra Abbot* (Boston, 1884).

ABBOT, FRANCIS ELLINGWOOD (1836–1903). An American writer on philosophy. He was born in Boston, Mass., and graduated at Harvard University (1859) and the Meadville Theological School (1863). After having had charge of Unitarian congregations from 1863 to 1868, he turned to journalism, and from 1870 to 1880 edited a weekly journal, the *Index*, devoted to religious topics. He published *Scientific Theism* (1886) and *The Way out of Agnosticism* (1890).

ABBOT, GEORGE (1562–1633). Archbishop of Canterbury. He was born at Guildford, Surrey, and was educated at Oxford (B.A. 1582; M.A. 1585; D.D. 1597). He took holy orders in 1585 and rose rapidly. His pronounced Puritanism brought him into conflict with William Laud. In 1609 he was appointed Bishop of Coventry and Lichfield and in 1610 he was translated to the see of London. In 1611 he was enthroned Archbishop of Canterbury. He owed these successive appointments to the marked favor of James I and used his exalted position to advance a narrow Protestantism and to persecute Roman Catholics. He also appeared in political life as the determined foe of Spain and France, largely because they were Roman Catholic countries. His courageous opposition to the King on several momentous occasions cost him after 1613 much of the royal favor. While under a cloud he had the misfortune, when hunting, accidentally to kill a gamekeeper. His enemies used the incident against him. Laud brought about a court of inquiry into the alleged infringement of canon law, and three persons designated to bishoprics refused to be consecrated by him. The inquiry came to nothing, but the stigma remained. The death of James I (1625) was an additional misfortune to Abbot, as Charles I was influenced by Laud. After 1627 he was practically deprived of the rights and privileges of his office. He died at Croydon, then the country residence of the Archbishop of Canterbury, Aug. 4, 1633. Of his writings the most popular was his commentary on the Book of Jonah (1600), which was reprinted with a life by Grace Webster (London, 1845).

ABBOT, HENRY LARCOM (1831—). An American soldier and engineer. He was born at Beverly, Mass., and graduated at the United States Military Academy, West Point, in 1854, entering the Corps of Engineers, in which he served with distinction until his retirement in 1895. He was engaged in the survey for the Pacific Railroad and the hydrographic survey of the Mississippi River delta. During the Civil War he was engaged in engineering and artillery operations. He was wounded at the battle of Bull Run in 1861. In the operations around Richmond he commanded the siege artillery. At the close of the war he was brevetted Major-General of Volunteers. For many years he was in command of the garrison of the engineer post at Willetts Point, N. Y., and while there developed the torpedo and submarine defense of the Long Island Sound approach to New York City and founded the school for engineers. In this connection he did much important work in military science, devoting himself to the design and construction of submarine mines and mortar batteries, as well as to the development of military engineering equipment and drill, and serving on the Gun Foundry Board, the Board on Fortifications

and Defenses, and numerous other military commissions. He was a member of the board to devise a plan for the protection and reclamation of the Mississippi basin. In 1872 he was elected a member of the National Academy of Sciences. He served as president of a board of consulting engineers to consider the question of a proposed ship canal from Pittsburgh to Lake Erie, and designed the harbor at Manitowoc, Wis. In May, 1897, he was appointed a member of the Technical Committee of the New Panama Canal Company. He is the author of *Siege Artillery in the Campaign against Richmond* (1867); *Experiments and Investigations to Develop a System of Submarine Mines for Defending Harbors of the United States* (1881), and with Gen. A. A. Humphreys, *Physics and Hydraulics of the Mississippi*, in addition to a large number of reports of military and engineering commissions and boards. Among his later writings may be mentioned *Problems of the Panama Canal* (1905-07).

ABBOT, JOSEPH HALE (1802-73). An American educator, born at Wilton, N. H. He graduated in 1822 at Bowdoin College, and from 1827 to 1833 was professor of mathematics and instructor in modern languages at Phillips Academy, Exeter. He contributed numerous valuable papers to the *Transactions* of the American Academy of Arts and Sciences and was an associate editor of Worcester's *Dictionary of the English Language* (1860).

ABBOT, SAMUEL (1732-1812). An American philanthropist. He was born at Andover, Mass., and was one of the founders of the Andover Theological Seminary, to which he gave \$20,000 in 1807 and \$100,000 more in his will. He was a successful merchant of Boston and a large contributor to charities.

ABBOT, THE. The title of one of Sir Walter Scott's novels, published in 1820. Its incidents form a sequel to *The Monastery*, and are based upon the history of Mary, Queen of Scots, in the years 1567 and 1568, ending with the battle of Langside and her escape to England.

ABBOT, WILLIS JOHN (1863—). An American author and editor, grandson of John S. C. Abbott. He was born at New Haven, Conn., and graduated at the University of Michigan in 1884. He is best known by his *Blue Jackets of '61*, *Blue Jackets of 1812*, and *Blue Jackets of '76*, a series of stories for boys relating to the naval history of the United States, and by his *Battle Fields of 1861*. Mr. Abbot was managing editor of the *Chicago Times* in 1892 and 1893, and from 1896 to 1898 was on the editorial staff of the *New York Journal*. His later writings include: *The American Merchant Ships and Sailors* (1902); *A Story of Our Navy for Young Americans* (1910); *Panama and the Canal in Picture and Prose* (1913).

ABBOT OF JOY (ABBÉ DE LIESSE). The title bestowed upon the chief of a brotherhood founded at Lille. Accompanied by a suite of officers and servants who bore before him a standard of red silk, he presided over the games which were held at Arras and the neighboring towns during the period of the carnival, coming under the general title of "Feast of the Ass" (q.v.). See also MISRULE, LORD OF.

AB'BOT OF MISRULE'. See MISRULE, LORD OF.

ABBOTSFORD, äb-ots-fërd. The estate of Sir Walter Scott, situated on the south bank of the Tweed, about three miles from Melrose Abbey.

Before it became, in 1811, the property of Scott, the site of the house and grounds of Abbotsford formed a small farm known as Clarty Hole. The new name was given it by the poet in remembrance of the days when Melrose abbots passed over the fords of the Tweed. On this spot, a sloping bank overhanging the river, with the Selkirk Hills behind, he built at first a small villa, now the western wing. He added the remaining parts of the building, on no uniform plan, but with the desire of combining some of the features (and even actual remains) of those ancient works of Scottish architecture which he most loved. The result was a picturesque and irregular pile, which has been aptly called "a romance in stone and lime." It remained in Scott's family to the fourth generation, but has lately been leased by rich Americans. See Irving's *Abbotsford* (London, 1850); Lockhart's *Life of Scott* (Edinburgh, 1838); Mary Scott's *Abbotsford* (New York, 1893), and Smith and Crockett's *Abbotsford* (New York, 1905).

AB'BOTT, AUSTIN, LL.D. (1831-96). An American lawyer, born in Boston, Mass., the son of Jacob Abbott. He graduated at the University of the City of New York in 1851 and was admitted to the bar in the following year. He was in partnership with his brothers, Benjamin Vaughan and Lyman (afterward editor of the *Outlook*). He gained a national reputation as counsel for Theodore Tilton in his suit against Henry Ward Beecher. He aided his brother Benjamin in the preparation of his well-known digests of laws and was himself a prolific legal author. His works, mostly of a practical character, included a comprehensive digest of *New York Statutes and Reports*, a treatise on *Trial Practice*, and a useful collection of legal forms, all of which are still of use to the profession. He also wrote, in collaboration with his two brothers, two novels, *Matthew Caraby* and *Conecut Corners*. He was an able lecturer on law and was Dean of the Law School of the University of the City of New York from 1891 until his death.

ABBOTT, BENJAMIN (1732-96). A Methodist Episcopal minister, born on Long Island, N. Y. He was apprenticed to a hatter in Philadelphia and subsequently to a farmer in New Jersey. He was converted from a dissipated life when about 40 years old, and immediately became an itinerant Methodist preacher. After 16 years' service in New Jersey he was assigned to the Dutchess (N. Y.) circuit in 1789. He was transferred to the Long Island circuit in 1791, to Salem, N. J., in 1792, to the Cecil circuit, Maryland, as presiding elder, in 1793, and died at Salem, N. J., in 1796. He was famous in his day and is still remembered as a "rousing" preacher. His vehemence was such that he frequently fainted and generally strongly moved his hearers.

ABBOTT, BENJAMIN VAUGHAN (1830-90). An American lawyer, the son of Jacob Abbott. He graduated at the University of the City of New York in 1850 and was admitted to the bar in 1852. In legal practice his brothers Austin and Lyman were associated with him. In conjunction with his brother Austin he produced nearly 100 volumes of reports and digests of Federal and State laws and a *Dictionary of Legal Terms and Phrases*. In 1865, as secretary of the New York Code Commission, he drafted a penal code which, when adopted by the Legisla-

ture, became the basis of the present code. In 1870 President Grant appointed him one of three commissioners to revise the statutes of the United States.

ABBOTT, CHARLES CONRAD (1843—). An American archæologist and naturalist, born at Trenton, N. J. He studied medicine at the University of Pennsylvania, and served as a surgeon in the Federal Army during the Civil War. From 1876 to 1889 he was assistant curator of the Peabody Museum in Cambridge, Mass., to which he presented a collection of 20,000 archæological specimens; he freely gave also to other archæological collections. His book *Primitive Industry* (1881) detailed the evidences of the presence of pre-glacial man in the Delaware valley, and is a valuable contribution to American archæology. He also published many books on out-door observation, such as *A Naturalist's Rambles about Home* (1884). His other works, besides some fiction, include: *Upland and Meadow* (1886); *Wasteland Wanderings* (1887); *Outings at Odd Times* (1890); *Clear Skies and Cloudy* (1899); *In Nature's Realm* (1900); *Rambles of an Idler* (1906); *Archæologia Nova Cæsarea* (1907-09); *Ten Years' Diggings in Lenâpé Land, 1901-11* (1912). He is well known as a frequent contributor to the *American Naturalist*, *Science*, *Nature*, *Science-News*, and *Popular Science Monthly*.

ABBOTT, EDWARD, D.D. (1841-1908). An American clergyman, journalist, and author, son of Jacob Abbott, born at Farmington, Me. He graduated in 1860 at the University of New York, studied from 1860 to 1862 at the Andover Theological Seminary, and in 1863 served in the United States Sanitary Commission at Washington and with the Army of the Potomac. He was ordained in 1863 to the Congregational ministry, and was pastor of Pilgrim Church, Cambridge, Mass., from 1865 to 1869. From 1869 to 1878 he was associate editor of the *Congregationalist*, and from 1878 to 1888 editor of the *Literary World*, whose direction he again assumed in 1895. In 1879 he was ordained a priest of the Protestant Episcopal Church and appointed rector of St. James's parish, Cambridge. His publications include *The Conversations of Jesus* (1875) and *Phillips Brooks* (1900).

ABBOTT, EDWIN ABBOTT (1838—). An English author, born in London. He graduated at St. John's College, Cambridge, with distinction (B.A. 1861, M.A. 1864); was assistant master in King Edward's School, Birmingham (1862-64), and head-master of the City of London School (1865-89), which he made one of the best day schools in England; retired in 1889, and received a pension the next year. He was twice Select Preacher at Cambridge and once at Oxford. He published *Francis Bacon* (London, 1885); *Cardinal Newman* (1892); *St. Thomas of Canterbury* (1898); *Shakespearean Grammar* (1869; 3d ed. revised and enlarged, 1870), a pioneer work which, though unscientific, has hardly been superseded; *Clue, a Guide through Greek to Hebrew Scripture* (1900); *Corrections of Mark Adopted by Matthew and Luke* (1901); *Comparison of the Words of the Fourth Gospel with those of the Three* (1905); *The Son of Man; or Contributions to the Study of the Thoughts of Jesus* (1910); *Light on the Gospel from an Ancient Poet* (Eng. ed., 1912; Am. ed., 1913); *The*

Fourfold Gospel, section i, Introduction (1913). His brother, **EVELYN ABBOTT** (1843-1901), of Balliol College, Oxford, wrote a *History of Greece* that is a memorial to its author's scholarship.

ABBOTT, EMMA (EMMA ABBOTT WETHERELL) (1849-91). An American soprano, born in Chicago, Ill. She began her musical experience in the choir of Plymouth Church, Brooklyn, N. Y., and afterwards studied in Milan under San Giovanni and in Paris under Delle Sedie. She made her début at Covent Garden, London, as Maria in *La Fille du Régiment*. For three years thereafter she made an operatic and concert tour of England and Ireland under the direction of Colonel Mapleson. Subsequently she returned to the United States, where she sang with the Abbott and Hess Opera Company, and later with the English opera company long known by her name. She sang in *Martha*, *Faust*, *Les Huguenots*, *The Chimes of Normandy*, and the more popular works of Verdi, Bellini, and Donizetti. With the exception of Clara Louise Kellogg, she was perhaps more widely known than any other American singer of her time. Consult H. C. Lahee, *Famous Singers of To-day and Yesterday* (Boston, 1898).

ABBOTT, FRANK FROST (1860—). An American Latinist, born at Redding, Conn. He graduated at Yale in 1882, and in 1891 received there the degree of Ph.D., after study also at Bonn and Rome in 1888-89. From 1885 to 1891 he was tutor at Yale; and in 1891 was appointed professor of Latin in the University of Chicago. He was also annual professor in the American School of Classical Studies at Rome, from 1901 to 1902, and became Associate Chairman of the Managing Committee of the same institution. He went to Princeton as Professor of Classics in 1908. He wrote *A History of Roman Political Institutions* (1901), *The Toledo Manuscript of the Germania of Tacitus* (1903), *A History of Rome* (1906), *Society and Politics in Ancient Rome* (1909), *The Common People of Ancient Rome* (1911), etc. He has contributed to various classical periodicals and became associate editor of *Classical Philology*.

ABBOTT, GEORGE FREDERICK. An English war correspondent and author. He was educated at Emmanuel College, Cambridge, taking the degree of B.A. in 1899. In 1900 he was sent by Cambridge University to Macedonia to make studies in the folk-lore of that country. He acted as special correspondent in southwestern Europe for several London newspapers until 1903. In 1905 he accompanied the Prince of Wales, now George V, on his tour of India. Besides contributing articles to many reviews and magazines, he wrote *Songs of Modern Greece* (1900); *Macedonian Folk-Lore* (1903); *The Tale of a Tour in Macedonia* (1903); *Through India with the Prince* (1906); *Israel in Europe* (editor, 1907); *Greece in Evolution* (1909); *Turkey in Transition* (1909); *The Philosophy of a Don* (1911); *The Holy War in Tripoli* (1912).

ABBOTT, GORHAM DUMMER (1807-74). An American Congregational clergyman and educator, born in Hallowell, Maine. He graduated at Bowdoin in 1826 and at Andover in 1831. With his brothers, Jacob and John S. C. Abbott, he was a pioneer in the higher or collegiate education of young women. In 1847 he founded the Spingler Institute, in New York City. The school maintained a high reputation during its

brief history. He wrote *The Family at Home*; *Nathan W. Dickerman*; *Pleasure and Profit*.

ABBOTT, JACOB (1803-79). A popular juvenile and didactic writer. He was born at Hallowell, Maine. He graduated at Bowdoin College in 1820. Like his brother John, he studied for the ministry at Andover, and was ordained to the Congregational ministry. From 1825 to 1829 he was professor of mathematics and natural philosophy at Amherst. He then established a girls' school in Boston, and in 1834 organized the Eliot Church, Roxbury. Five years later he moved to Farmington, Me. He passed the remainder of his life there, in New York, and in foreign travel, devoting himself wholly to literature. He died at Farmington Oct. 31, 1879. Abbott published more than 200 volumes, the most noteworthy of which are *The Rollo Books* (28 vols.), *The Franconia Stories* (10 vols.), *The Rainbow and Lucky Series* (5 vols.), a number of juvenile histories, written in collaboration with his brother, and a series of histories of America. He also edited many school books. His style had a singular fascination for the young, and many of his writings were popular.

ABBOTT, SIR JOHN JOSEPH CALDWELL (1821-93). A Canadian statesman, born at St. Andrew's, Quebec. He was educated at McGill College, Montreal; studied law, and in 1847 was called to the bar. Beginning in 1859, he represented Argenteuil County in the Canadian Assembly until the union in 1867, when he became a member of the Dominion Parliament for the same place. In 1862 he was solicitor-general in the cabinet of John Sandfield Macdonald, but resigned before his chief lost power. In 1887 Sir John A. Macdonald invited him to join the cabinet as a minister without portfolio. In June, 1891, on the death of Sir John A. Macdonald, Abbott was made Premier of the Dominion government, but resigned in November, 1892, because of his ill health. He took a seat in the cabinet of his successor, Sir John Thomson, but without a portfolio. He was Dean of the Faculty of Law of McGill University for ten years, was considered an authority on commercial law, and was knighted in 1892.

ABBOTT, JOHN STEVENS CABOT (1805-77). An American historian, pastor, and pedagogical writer, a brother of the equally prolific Jacob Abbott (q.v.). He was born at Brunswick, Maine, and graduated at Bowdoin College in 1825. He studied for the ministry at Andover and was ordained a Congregational minister in 1830. He held successive pastorates at Worcester, Roxbury, and Nantucket, Mass. His writings were, from the outset, popular. Beginning with semi-religious pedagogy, *The Mother at Home* (1833), *The Child at Home*, etc., he was presently diverted to history, and after 1844 resigned his pastorate, giving himself entirely to literature. He died at Fairhaven, Conn., June 17, 1877. His most noteworthy books are *The French Revolution*, *The History of Napoleon Bonaparte* (1855), *Napoleon at St. Helena*, *The History of Napoleon the Third* (1868), *The History of the Civil War in America* (1863-65), and *The History of Frederick II, Called Frederick the Great* (New York). All these are readable, and the books on Napoleon were very popular, but none of them has any critical value. In 1910 a series of twenty short biographies of historical characters by J. S. C. and Jacob Abbott, was published.

ABBOTT, LYMAN, D.D. (1835—). An American Congregational clergyman and editor. He was born at Roxbury, Mass., a son of Jacob Abbott. He graduated at the New York University in 1853 and for a time practiced law with his brothers Austin and Benjamin Vaughan Abbott. Afterward he studied theology with his uncle, Rev. John S. C. Abbott, and became pastor of a church at Terre Haute, Ind., in 1860. Five years later he was made secretary of the American Union (Freedman's) Commission and became pastor of the New England Church in New York City. In 1869 he resigned this pastorate and thereafter was successively one of the editors of *Harper's Magazine*, the principal editor of the *Illustrated Christian Weekly*, and, as associate of Henry Ward Beecher, an editor of the *Christian Union* (now the *Outlook*), of which he afterward became editor-in-chief (1882). He succeeded Mr. Beecher as pastor of Plymouth Church, Brooklyn, in 1888, but resigned in May, 1899, and has since devoted himself to editorial and literary work chiefly in connection with the *Outlook*. In collaboration with his brothers Austin and Benjamin he wrote two novels, *Connect Corners* (1885); and *Matthew Caraby* (1888). Among his other numerous works are commentaries, *Jesus of Nazareth* (1869); *Life of Henry Ward Beecher* (1883); *In Aid of Faith* (1885); *Christianity and Social Problems* (1896); *The Theology of an Evolutionist* (1897); *Life and Letters of Paul* (1898); *Life and Literature of the Ancient Hebrews* (1901); *The Rights of Man* (1901); *The Great Companion* (1904); *Personality of God* (1905); *Industrial Problems* (1905); *The Other Room* (1905); *Christ's Secret of Happiness* (1907); *The Home Builder* (1908); *The Temple* (1909); *The Spirit of Democracy* (1910); *America in the Making* (Yale lectures on the responsibilities of citizenship, 1911); *Letters to Unknown Friends* (1913).

ABBOTT, NATHAN (1854—). An American lawyer and law teacher of distinction, born at Norridgewock, Maine, the son of Abiel Abbott. He was educated at Yale College, graduating in 1877, and studied law in Boston University. After some years of practice in the city of Boston he was invited to become Tappan Professor of Law in the University of Michigan, and from that time on has devoted himself exclusively to legal scholarship and teaching. After a year at the University of Michigan, Professor Abbott was appointed Professor of Law in Northwestern University and two years later, in 1895, he became Professor of Law and Dean of the Law School of Leland Stanford University. This position he held until 1907, since which time he has been a member of the Law Faculty of Columbia University, New York City. He is a legal scholar of wide reputation and is a recognized authority on the English and American Law of Real Property.

ABBOTT, THOMAS KINGSMILL (1829-1913). An Irish scholar and educator. He was born at Dublin and was educated at Trinity College, where he afterward occupied the chair of moral philosophy (1867-72), of biblical Greek (1875-88), and of Hebrew (1879-1900). He wrote the following books: *The Elements of Logic* (3d ed., 1895); *Essays*, chiefly on the original texts of the Old and New Testaments (1892); *A Commentary on Ephesians and Colossians* (1897); a translation of *Kant's Ethics*, with a memoir (6th ed., 1909); *Kant's Introduction*

to *Logic* (5th ed., 1878); *Elementary Theory of the Tides* (2d ed., 1901); *Catalogue of Fifteenth Century Books in the Library of Trinity College, Dublin, etc.* (1905).

ABBOTT, WILBUR CORTEZ (1868—). An American historian and educator, born at Kokomo, Ind., and graduated from Wabash College in 1892. He was a graduate student at Cornell University from 1892 to 1895, and in 1897 studied at Oxford, where he received the degree of B.Litt. He studied also in several continental universities. In 1892-93 he was a fellow at Cornell; from 1893 to 1895 was instructor in European history, and in 1895-96 was President White traveling fellow in that university. He became successively instructor in history at the University of Michigan (1897), assistant professor of history in Dartmouth College (1899), professor of European history in the University of Kansas (1902), and professor of history at the Sheffield Scientific School, Yale (1908). He contributed to American and English historical reviews and wrote *Colonel Blood, Crown Stealer* (1911).

ABBREVIATIONS (Lat. *ad*, to + *brevis*, short). Contrivances in writing for saving time and space. They are of two kinds, consisting either in the omission of some letters or words, or in the substitution of some arbitrary sign. In the earliest times, when uncial or lapidary characters were used, abbreviations by omission prevailed, such as we find in the inscriptions on monuments, coins, etc. In these the initial letter is often put for the whole word, as M. for Marcus, F. for Filius. It was after the small Greek and Roman letters had been invented by transcribers for facilitating their work that signs of abbreviation, or characters representing double consonants, syllables, and whole words, came into use. Greek manuscripts abound in such signs, and often only one who has expressly studied Greek paleography can make them out. From the manuscripts they passed into the early printed editions of Greek books, and it is only within the last century that they have quite disappeared. Among the Romans the system was carried to such an extent that L. Annæus Seneca collected and classified 5000 abbreviations. The same practice has prevailed in all languages, but nowhere more than in the rabbinical writings. The abbreviations used by the ancient Romans were continued and increased in the Middle Ages. They occur in inscriptions, manuscripts, and legal documents; and the practice endured in these long after the invention of printing had made it unnecessary in books. An act of Parliament was passed in the reign of George II, forbidding the use of abbreviations in legal documents. Owing to these abbreviations, the deciphering of old writings requires special study and training, and forms a separate science, on which numerous treatises have been written. One of the most exhaustive is Tassin's *Nouveau traité de diplomatique* (6 vols., Paris, 1750-65). See PALEOGRAPHY.

In ordinary writing and printing few abbreviations are now employed. The sign &, originally an abbreviation for the Latin *et*, 'and,' is one of the few still to be met with of this arbitrary kind. It does not stand properly for a word, for it is used in different languages, but for an idea, and is as much a symbol as +. The abbreviations by using the initials of Latin

words that are still in use are chiefly confined to titles, dates, and a few phrases; as M.A. (*magister artium*), Master of Arts; A.D. (*anno Domini*), in the year of our Lord; *e.g.* (*exempli gratia*), for example. Many are now formed from English words in the same way; as F.G.S., Fellow of the Geological Society; B.C., before Christ.

The following table contains many of the more important abbreviations in general use. There are omitted from it many others whose meanings are obvious, and all abbreviations for days, months, countries, States, many proper names, as those of the Scriptures; grammatical, scientific, and other technical terms; familiar titles, as *Mr.*, *Gov.*; and the majority of commercial terms, as B/l, bill of lading. The names of many societies are omitted, especially when their abbreviations, as *Y. M. C. A.*, are well known.

- A.B., Bachelor of Arts.
- Abp., Archbishop.
- A.C. (*ante Christum*), Before Christ.
- Accel. (*accelerando*), In music, more quickly.
- A.D. (*anno Domini*), In the year of our Lord.
- A.D.C., Aide-de-camp.
- Ad lib. (*ad libitum*), At pleasure.
- Aet. (*ætatis*), Of (his or her) age.
- Aevia, Alleluia. In reprints of old music. Consonants are omitted; old *u* written *v*.
- A.H. (*anno Hegiræ*), In the year of the Hegira (reckoning from 622 A.D.).
- A.M. (*ante meridiem*), Before noon; (*anno mundi*), In the year of the world; (*artium magister*), Master of Arts.
- An. (*anno*), In the year.
- Anon., Anonymous.
- Appettando. In music, hurrying.
- A.R.A., Associate of the Royal Academy (London).
- A.S.A., American Statistical Association.
- A tem. In music, after increasing or retarding the time a return to the prescribed time.
- A.T.S., American Tract Society.
- A.U.C. (*ab urbe condita*), From the building of the city—that is, Rome.
- A.V., Authorized Version.
- b., Born.
- B.A. or A.B. (*artium baccalaureus*), Bachelor of Arts.
- Bart. or Bt., Baronet.
- B.C., Before Christ. In music, *basso continuo* (see FIGURED BASS).
- B.C.L., Bachelor of Civil Law.
- B.D., Bachelor of Divinity.
- B.L., Bachelor of Letters.
- B.LL., Bachelor of Laws.
- B.M., Bachelor of Medicine.
- B.Mus., Bachelor of Music.
- Bp., Bishop.
- B.S. or B.Sc., Bachelor of Science.
- B.V.M., Blessed Virgin Mary.
- C. (*centum*), a hundred; chapter; *c.* (*circa*), about; *c.* century. Also C. = Centigrade.
- C.A., In music, *col arco*, with the bow.
- Cantab. (*Cantabrigiensis*), Of Cambridge. In music, *cantabile*, with singing tone.
- C.B., Companion of the Bath.
- C.E., Civil Engineer.
- cf. or cp., Confer; compare.
- Ch., In music, choir-organ (see ORGAN).
- C.I., Order of the Crown of India.
- C.I.E., Companion of the Order of the Indian Empire.

C.M.G., Companion of St. Michael and St. George.
 Co., County.
 c/o., Care of.
 C.O.D., Cash, or collect, on delivery.
 Cr., Creditor.
 Cresc. (*crecendo*), In music, a gradual increase of tone.
 C.S.I., Companion of the Star of India.
 cwt., Hundred-weight.
 d. (*denarius*), Penny; died.
 Dal S., In music, *dal segno*, repeat from the sign indicating repetition.
 D.C. (*da capo*), From the beginning; District Court; District of Columbia.
 D.C.L., Doctor of Civil Law.
 Decresc., In music, *decrescendo* = *diminuendo*.
 D.D., Doctor of Divinity; *donum dedit*.
 D.D.S., Doctor of Dental Surgery.
 D.G. (*Dei gratia*), By the grace of God; (*Deo gratias*), thanks be to God.
 Dim. (*diminuendo*), In music, a gradual decrease of tone.
 Div., In music, *divisi*, strings divided.
 D.Lit., Doctor of Literature.
 Do. (Ital. *detto*, said), Ditto, the same.
 D.O.M. (*Deo optimo maximo*), To God the best and greatest.
 Dr., Doctor, debtor.
 D.Sc., Doctor of Science.
 D.S.O., Companion of the Distinguished Service Order.
 D.V. (*Deo volente*), God willing.
 dwt., Pennyweight.
 e.g. or ex. gr. (*exempli gratia*), For example.
 Esp., In music, *espressivo*, with expression.
 et al. (*et alii*), And others.
 etc. (*et cetera*), And the rest; and so on.
 et seq. (*et sequentia*), And the following.
 F., Fahrenheit.
 f. (*forte*), loudly.
 f. or ff., Following.
 F. and A. M., Free and Accepted Masons.
 F.D. (*fidei defensor*), Defender of the Faith.
 ff. (*fortissimo*), Very loud.
 fl. (*floruit*), Flourished.
 F.M., Field Marshal.
 F.O., In music, full organ.
 fp., In music, *forte piano* = *sforzato* (see SF).
 F.R.C.P., Fellow of the Royal College of Physicians.
 F.R.C.S., Fellow of the Royal College of Surgeons.
 F.R.G.S., Fellow of the Royal Geographical Society.
 F.R.S., Fellow of the Royal Society.
 F.S.A., Fellow of the Society of Antiquaries.
 G.C.B. (Knight), 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.O., In music, great organ.
 H.B.M., His (or Her) Britannic Majesty.
 H.E., His Eminence; His Excellency.
 H.I.H., His (or Her) Imperial Highness.
 H.M.S., His (or Her) Majesty's Service, or Ship.
 H.S.H., His (or Her) Serene Highness.
 I. (*imperator* or *imperatrix*), Emperor or Empress.
 ib. or ibid. (*ibidem*), In the same place.
 Id. (*idem*), The same; (*Idus*), the Ides.
 i.e. (*id est*), That is.

I.H.S.* (*Iesus Hominum Salvator*), Jesus the Saviour of men.
 Incog. (Ital. *incognito*), Unknown.
 Inf. (*infra*), Below.
 In loc. (*in loco*), In the place referred to.
 I.N.R.I. (*Iesus Nazarenus Rex Iudæorum*), Jesus of Nazareth, the King of the Jews.
 Inst. (*instante—mense* understood), In the current (month).
 I.O.O.F. Independent Order of Odd Fellows.
 J.C.D. (*juris civilis doctor*), Doctor of Civil Law.
 J.P., Justice of the Peace.
 Jr., Junior.
 J.U.D. (*juris utriusque doctor*), Doctor of Laws, i.e., both of civil and canon law.
 Kal. (*Kalendæ*), The Kalends.
 K.C., King's Counsel.
 K.C.B., Knight Commander of the Bath.
 K.C.M.G., Knight Commander of St. Michael and St. George.
 K.C.S.I., Knight Commander of the Star of India.
 K.P., Knight of St. Patrick.
 K.T., Knight of the Thistle.
 L. (*libra*), Pound (in English money).
 lb (*libra*), Pound (weight).
 l.c. (*loco citato*), In the place cited; (lower case) small letters in printing.
 leg. (*legato*), Smoothly; in a connected manner.
 L.H., In music, *linke Hand*, left hand.
 L.H.D. } (*litterarum humaniorum doctor*),
 Litt.D. } Doctor of Literature, or Letters.
 LL.B. (*legum baccalaureus*), Bachelor of Laws.
 LL.D. (*legum doctor*), Doctor of Laws.
 L.S. (*locus sigilli*), The place of the seal.
 M., Monsieur; MM., Messieurs (plural); (*meridies*) noon.
 M.A., Master of Arts.
 Manc., In music, *mancando*, dying away.
 M.B., Bachelor of Medicine.
 M.C., Member of Congress.
 M.D. (*medicinæ doctor*), Doctor of Medicine.
 In music, *main droite*, *mano destra*, right hand.
 M.E., Mining or Mechanical Engineer; Methodist Episcopal.
 mf. (*mezzo forte*), Moderately loud.
 M.F.H., Master of Fox Hounds.
 M.G., In music, *main gauche*, left hand.
 Mlle., Mademoiselle.
 M.M., In music, *Maelzel's Metronome*. (See METRONOME.)
 Mme., Madame.
 M.P., Member of Parliament; Methodist Protestant.
 M.S. or M.Sc., Master of Science.
 MS., Manuscript; MSS., manuscripts.
 Mov., In music, *movendo* = *mancando* (q.v.).
 Mus.B. (*musicæ baccalaureus*), Bachelor of Music.
 Mus.D. (*musicæ doctor*), Doctor of Music.
 N.B. (*nota bene*), Mark well.
 n.d., No date.
 nem. con. (*nemine contradicente*), Unanimously.
 Non. (*nonæ*), The Nones.
 N.S., New style.

* This was originally written IHΣ, the first three Greek letters of the name Jesus; but its origin having been lost sight of, by substituting S for Σ and then mistaking the Greek H (long e) for Latin H, a signification was found for each letter. The symbol was further developed by converting the horizontal stroke, which was the sign of abbreviation, into a cross, in which form it is the recognized device of the Jesuit order.

- Ob. (*obiit*), Died.
- Op., In music, *opus*, work.
- O.P. (*ordinis prædicatorum*), Of the Dominican Order.
- O.S., Old style.
- O.S.A., Order of St. Augustine.
- O.S.F., Order of St. Francis.
- Oxon. (*Oxoniensis*), Of Oxford.
- p., Page; pp., pages.
- p. (*piano*), Softly.
- P.C., Privy Councilor.
- P.E., Protestant Episcopal.
- Pfte., In music, pianoforte.
- Ph.B. (*philosophiæ baccalaureus*), Bachelor of Philosophy.
- Ph.D. (*philosophiæ doctor*), Doctor of Philosophy.
- Ph.G., Graduate Pharmacist.
- Pizz., In music, *pizzicato* (q.v.).
- P.L., Poet Laureate.
- P.M. (*post meridiem*), After noon; postmaster.
- pp. (*pianissimo*), Very softly.
- P.P., Parish priest.
- P.P.C. (Fr. *pour prendre congé*), To take leave.
- pro tem. (*pro tempore*), For the time.
- prox. (*proximo—mense* understood), In the next (month).
- P.S. (*post scriptum*), Postscript.
- P.T.O., Please turn over.
- Q., Query or question.
- Q.C., Queen's Counsel.
- Q.E.D. (*quod erat demonstrandum*), Which was to be proved.
- Q.E.F. (*quod erat faciendum*), Which was to be done.
- Q.S. (*quantum sufficit*), A sufficient quantity.
- q.v. (*quod vide*), Which see.
- R. (*rex* or *regina*), King or queen. Also, R. = Réaumur.
- R. or R̄ (*recipe*), Take.
- R.A., Royal Academician; Royal Artillery; Royal Arch.
- rall. (*rallentando*), More slowly.
- R.A.M., Royal Academy of Music.
- R.C., Roman Catholic.
- R.E., Royal Engineers.
- Recit., In music, recitative (q.v.).
- R.H., In music, *rechte Hand*, right hand.
- rinf., In music, *rinforzando*, increasing in loudness.
- R.I.P. (*requiescat in pace*), May he rest in peace.
- rit. (*ritardando*), More slowly.
- rit. or riten., In music, *ritenuto*, retarding.
- R.M., Royal Marines.
- R.N., Royal Navy.
- R.S.V.P. (Fr. *répondez s'il vous plaît*), Please reply.
- R.V., Revised version.
- S., Saint; south; shilling; SS., saints.
- sc. (*scilicet*), Namely; understood.
- sf. (*sforzando*), With marked emphasis.
- S.J., Society of Jesus.
- smorz., In music, *smorzando* = *mancando* (q.v.).
- Sost. or sosten., In music, *sostenuto*, sustained.
- s.p. (*sine prole*), Without issue.
- S.P.Q.R. (*senatus populusque Romanus*), The Senate and People of Rome.
- sq. (*sequens*), The following; sqq. in the plural.
- Sr., Senior.
- S.S., Steamship; Sunday school.
- St., Saint; street.
- S.T., In music, *senza tempo*, without regard to time.
- Stacc., In music, *staccato* (q.v.).
- S.T.B. (*sanctæ theologiæ baccalaureus*) Bachelor of Sacred Theology.
- S.T.D. (*sanctæ theologiæ doctor*), Doctor of Sacred Theology.
- S.T.P. (*sanctæ theologiæ professor*), Professor of Sacred Theology.
- Str., In music, stringed instruments.
- String., In music, *stringendo* (q.v.).
- sup. (*supra*), Above.
- s.v. (*sub voce*), Under the heading.
- Sw., In music, swell-organ (see ORGAN).
- T.C., In music, *tre corde*, without soft pedal.
- T.C.D., Trinity College, Dublin.
- Tempo I, In music, *tempo primo*, the time indicated at the beginning of a composition.
- Ten., In music, *tenuto*, held to the full time-value.
- Timp., In music, *timpani*, kettle-drums (q.v.).
- Tr., In music, *trillo*, trill (q.v.).
- trem., In music, *tremolo* (q.v.).
- Twp., Township.
- U.C., In music, *una corda*, with soft pedal.
- ult. (*ultimo—mense* understood), In the last (month).
- U.P., United Presbyterian.
- U.S., United States.
- U.S.A., United States of America; United States Army.
- U.S.N., United States Navy.
- Var., In music, variation (q.v.).
- Vc., In music, violoncello.
- V.C., Victoria Cross; Vice Chancellor.
- Vl., Vno., In music, violin.
- vs. (*versus*), Against.
- V.S., In music, *volti subito*, turn quickly.
- For a reproduction of 13,000 abbreviations used in old Latin MSS., consult Campelli, *Dizionario di Abbreviature* (Milan, 1899); Dobbs, *Abbreviations British and Foreign* (1911).
- ABBREVIATIO PLACITORUM**, a-brē'vī-ā'shī-ō plās'ī-tō'rūm (Lat. abridgment or abstract of pleas). A record of judicial decisions in the itinerant Court of the King's Bench (*curia regis*, q.v.) in the Norman period of English law. It is one of the earliest collections of judicial precedents in our law, antedating the *Year Books* (q.v.). It was first published in 1811. See articles on NORMAN LAW; PLEA; PLEADING; MASTER OF THE ROLLS; and REPORT.
- ABBREVIATORS**. In the Papal Court, a college of eleven prelates to whom the revision of the papal bulls and other similar documents is committed, and who sign them in the name of the Cardinal Vice Chancellor. They date from Pius II (1458-64), and derive their name from the fact that by means of traditional abbreviations they prepared a short minute of the decision, which they subsequently expanded into proper form.
- ABBT**, äpt, THOMAS (1738-66). A German popular rationalistic philosopher and prosaist. He was born at Ulm and educated at the University of Halle; under the influence of Lessing, Shaftesbury, Hume, and Voltaire; 1760, assistant professor of philosophy at Frankfort-on-the-Oder; 1761, professor of philosophy and mathematics at Rinteln; 1765, disliking academic duties, he refused calls to Marburg and Halle, but went as high ecclesiastical official to the court of William I of Lippe-Schaumburg at Bückeburg, where he died near the close of his

twenty-eighth year. Although the two essays "Vom Tode fürs Vaterland" (1761) and "Vom Verdienste" (1765) made his reputation, his best work was journalistic. His miscellaneous works were published (1768-81) in 6 volumes.

ABCHERON, äb'she-rön', or **ABSHERON**. See **APSIHERON**.

ABD, äbd. In Arabic and in the Semitic languages in general, 'slave' or 'servant,' as in Abd-Allah, 'servant of Allah'; Abd-al-Kadir, 'servant of the mighty one,' etc.

ABD ALLAH IBN ABD AL MUTTALIB, äb-dal'lä ibn äb'd al mut-täl'lëb. The father of Mohammed. Very little is known concerning his life. Al Kalbi states that he was born in the 24th year of Khosru Nushirwan's reign, consequently in 554, but that may be a mere guess. No value can be attached to the story that Abd al Muttalib vowed to sacrifice a son, if he should have 10 sons, but that he was persuaded to substitute 100 camels for Abd Allah. That 200 maidens of Mecca died of broken hearts from love of the handsome youth on his wedding day is another of these worthless legends. His wife's name was Amina, and we know from the Koran (93, 6) that Mohammed became an orphan at an early age.

ABD ALLAH IBN YASIN AL JUZULI. The founder of the sect of the Almoravides (q.v.). His mother belonged to the tribe of the Juzula; hence his surname. He lived in Nafis, the later Marra'kush (Morocco) in 1037 and studied with Wajjaj, a disciple of Abu Imran of Fez, the Malikite teacher, when he was invited by Yahya b. Ibrahim, a Sanhaja chief, to accompany him as a missionary to his home on the borders of the Sahara. After some time he retired from preaching to an island in the Senegal where he lived with his followers in a *ribat*, at once a hermitage and a fortress, devoting himself to ascetic exercises and preparation for the holy war. He was proclaimed Imam (q.v.) and took an active part in the establishment of the power of the Almoravides in Morocco. He died in 1059. See E. Doutté in *Revue de l'Histoire des religions* (xl and xli, pp. 29 ff.); and A. Müller, *Der Islam im Morgen- und Abendland II* (1887, pp. 611 ff.).

ABD ALLAH IBN ZUBAIR, äb-däl'lä 'b'n sōō'bār' (622-692). Ruler of Mecca, and for some years recognized Caliph of the largest part of the Muslim world. He was the son of Zubair and Asma, the nephew of the prophet and the grandson of Abu Bekr on his mother's side. He believed himself more entitled to the Caliphate than Muawiya, but during his reign concealed his claims. But he refused to recognize Yazid (680) and after Husain's death allowed himself to be proclaimed Caliph by the people of Mecca and took the title *Amir al Muminin* (681). He was recognized everywhere in Hejaz, but soon had to endure a siege of Mecca by Yazid's generals, during which both the city and its famous temple suffered much. Yazid's death, however, in 683, put an end to the siege. Irak, Arabia, and a large part of Syria now recognized him as Caliph; and he sent his governors to the different provinces. But Abd al Malik renewed the war, and his general, Al Hajjaj, besieged Mecca again. After a stubborn resistance it was finally taken, in 692, and Abd Allah, urged into the fight by his proud mother, fell in the battle. See Quatremère, "Notice sur la vie d'Abd Allah b. Zubair," in *Journal Asiatique* (2d series, ix, pp. 299 ff., 385 ff.).

ABD-AL-LATIF, äb-däl-lä-tëf' (1160-1231). A prolific Arabian writer, physician, and traveler. He was born at Bagdad and died while on the pilgrimage to Mecca. His early training consisted in memorizing not only the Koran, but also works on law, philology, and the standard poets. He then went to Damascus, whither Saladin had assembled the learned men of the Mohammedan world. Thanks to the liberality of Saladin and with letters of introduction from his vizier, Fadhl, Abd-al-Latif was able to travel to Egypt, and in Cairo he sought out the great Jewish doctor and philosopher, Maimonides. At Cairo he taught medicine and philosophy, but his love of travel brought him to Damascus again and to Aleppo. Of the many works of Abd-al-Latif only one, *The Account of Egypt*, is generally known. This was translated into Latin by White (1800) and into French by De Sacy (1810), *Relation de l'Egypte* (Paris, 1810). Consult Brockelmann, *Geschichte der arabischen Litteratur* (Weimar, 1898).

ABDALWADIDS, äb'däl-wä'dïdz. A Berber dynasty reigning in Tlemcen (q.v.) from 1239 to 1554. The name of the father of the first independent king was Zayyan; after him this dynasty is also often designated as the Banu Zayyan. Concerning Abd al Wad, or the early history of the family, little is known. But through various ruins, inscriptions, and historical documents the history of the dynasty has been well ascertained. The Abdalwadids maintained a splendid court at Tlemcen and reigned with wisdom and moderation for more than three centuries over the middle Maghrib, or the western part of Algiers. See especially, A. Bel, *Histoire des Beni 'Abd al Wad, Rois de Tlemcen* (Algiers, 1904).

ABD AL WAHHAB, äbd'el-wäh'häb. See **WAHABIS**.

ABD-EL-AZIZ, äb'del-ä-zëz', **MULAI** (1878—). Sultan of Morocco from 1894 to 1908. He was born at Marakesh, and succeeded his father, Sultan Mulai Hassan, in 1894. He was friendly towards Europeans, taking great interest in all kinds of Western inventions. His foreign sympathies offended his subjects, and in 1902 a formidable rebellion broke out under the leadership of a prophet, Bu Hamara. The resulting disorders gave France an opportunity to establish its predominance in the country and led to the Algeiras Conference in 1906, by which France and Spain were commissioned to maintain order on the Moroccan coast. The Sultan, however, was unable to cooperate with them because of his growing unpopularity, and trouble continued. In 1907 Mulai Hafid, elder brother of Abd-el-Aziz, was hailed by southern tribes as Sultan, and the ruler found it necessary to remove his capital from Fez to Rabat. Although the existing government received a loan from France, it was unable to regain its footing. The throne was declared vacant in January, 1908, by the Ulema (religious hierarchy) of Fez, and offered to Mulai Hafid. Abd-el-Aziz, having failed in an attempt to regain his authority by force, came to terms with his brother and retired to private life in Tangier. See **MOROCCO**.

ABD EL KADER IBN MOUHI AD-DIN, äb'dël-kä'dër 'b'n mōō'hë äd-dën' (c.1807-83). A celebrated Arabian chief. He was born near Mascara and was educated under the supervision of his father at the Ghetna, an educational institution of the Marabouts. In his eighth year Abd el Kader made a pilgrimage to Mecca with his father; and in 1827 he visited Egypt, where,

in Cairo and Alexandria, he first came in contact with western civilization. He had a gifted mind, and a character marked by religious enthusiasm and a tendency to melancholy. He was free from cruelty and sensuality. He studied in the chief schools of Fez, maintained the faith of his people, and used their fanaticism as one of his most important sources of influence. His public career began at the time of the conquest of Algiers by the French. No sooner was the power of the Turks broken than the Arab tribes of the province of Oran seized the opportunity to make themselves independent. They obtained possession of Mascara and elected Abd el Kadir their emir. He established his authority over a number of the neighboring tribes. He attacked the French, and after two bloody battles, fought on Dec. 3, 1833, and Jan. 6, 1834, against General Desmichels, then commanding in Oran, obliged the latter to enter into a treaty with him. In the interior of the country his power spread rapidly. The cities and tribes of the provinces of Oran and Titeri acknowledged him as their sultan; the more distant tribes sent him ambassadors with presents. Hostilities were soon resumed between him and the French. (See ALGERIA.) Abd el Kader was defeated (1841) and took refuge in Morocco. There he succeeded in organizing a religious war against the enemies of Islam, and the arms of France were now turned against Morocco for the support given to him. After the decisive battle of Isly (1844) the Sultan of Morocco was obliged to give up Abd el Kader's cause, but soon found that the latter was at least his equal in power. The end of Abd el Kader's power, however, had come. On the night of Dec. 11, 1847, he made a bold attack on the Moorish camp, in which he was defeated. He fled with his followers to Algeria, where the greater part surrendered to the French. Dispirited, Abd el Kader surrendered, Dec. 22, 1847, to General Lamoricière and the Duc d'Aumale. Although now given an annual pension of 100,000 francs, he was kept a prisoner with his family at Toulon, Pau, and the Château d'Amboise. Liberated in 1852 by Napoleon III, he lived at Brussa, in Asia Minor, till 1855. He then, for a time, lived in Constantinople, and finally made his home in Damascus. For his services during the Syrian massacres of 1860 he received the Grand Cross of the Legion of Honor from Napoleon III. In 1865 he visited Paris and England, and was present at the Paris Exposition in 1867. In his retirement he wrote a religious work, a translation of which was published at Paris in 1858, under the title, *Rappel à l'intelligent: avis à l'indifférent*. He died in Damascus, May 26, 1883. See ALGERIA. Consult C. H. Churchill, *The Life of Abd-el-Kader* (London, 1867), described as "written from his own dictation and compiled from other authentic sources," highly eulogistic, and in no sense a scientific biography: Laménaire, *Vie, aventures, combats, amours et prise d'Abd-el-Kader* (Paris, 1848); Bellemare, *Abd-el-Kader, sa vie politique et militaire* (Paris, 1863) and the "Life" by Pichon (1899).

ABD-EL-MELEK, äb'dël-mä'lëk. See ASMAI.

ABD EL MUMIN ABU MOHAMMED, äbd ä'l mōō'mën ä'boo mō-häm'mëd (c.1094-1163). The founder of the dynasty of the Almohades (q.v.). He was born at Tajira, in the Province of Tlemcen, north Africa, and was a member of the Kumiya, one of the Berber tribes of the

Atlas region. After the death of Ibn Tumart, the founder of the sect of the Almohades, who had shown great favor to Abd el Mumin, he was chosen as his successor. He now assumed the title of Caliph, put the Almoravides to flight, and conquered the cities of Oran, Tlemcen, Fez, Salé, Ceuta, and finally, after a siege of eleven months, Morocco (1140-47). He extended his dominion over Al-Maghrib and the other provinces of north Africa, and passed over into Spain, conquered Cordova (1148), Almeria (1151), and Granada (1154); in short, the greater part of Mohammedan Spain.

AB'DEMON. A Tyrian who distinguished himself by solving the riddles which had been propounded to his master, Hiram, by King Solomon. According to the story, Solomon challenged Hiram and the Tyrians to a contest of wits, each side sending riddles for solution by the other. Solomon had already won in the competition, and the amount agreed upon as a wager had been paid him, when Abdemon entered the lists, and not only found answers to the riddles which had baffled his countrymen, but also invented others. Solomon failed to answer them and returned the forfeit.

ABDE'RA (Gk. "Αβδηρα). A town on the coast of Thrace between the mouth of the Nestus and Lake Bistonis. It is fabled to have been founded by Hercules on the spot where his favorite, Abderus, was torn to pieces by the steeds of Diomedes. It was colonized 656 B.C. under the leadership of Timesius of Clazomenæ, but soon after was destroyed by the Thracians; in 543 B.C. it was recolonized by the inhabitants of Teos. It was the birthplace of Protagoras, Democritus, Anaxarchus, Hecataeus (the philosopher and grammarian, of the time of Alexander the Great), and other distinguished men. The natives were, however, proverbial for stupidity, and "Abderite" was hence a term of reproach.

ABD ER RAHMAN or **ABDERRAHMAN**, äb'dërrä'män. The name of several Arab rulers of Spain. See OMMIADS.

AB'DICA'TION (Lat. *abdicatio*, renunciation, from *ab*, away from + *dicare*, to proclaim). The renunciation of an office, generally the office of ruler or sovereign. It is rarely done out of pure preference of a private station, but is generally the result of vexation and disappointment. The general well-being of a State is sometimes served by the abdication of its ruler. Military reverses, popular disaffections, court scandals, and other causes often render it imperative. History records many abdications of this character. It was perhaps voluntarily and from being wearied with dominion that Diocletian, and along with him Maximian, abdicated (305). Christina of Sweden retired from the throne (1654) out of preference for the freedom of private life, but wished still to exercise the rights of a sovereign. Charles V of Germany laid down the crown (1556) and assumed the humble habit of a monk, because his great schemes had failed. Philip V of Spain laid down the crown in 1724, but resumed it on the death of his son. Amadeus VIII of Savoy abdicated (1449) to become a priest. Victor Amadeus II of Sardinia, who abdicated in 1730, wished to recall the step, but this was not allowed. Louis Bonaparte resigned the crown of Holland in 1810 rather than consent to treat that country as a province of France. Charles Emmanuel II of Sardinia retired from the throne

in 1802, not finding himself able to cope with the French. Victor Emmanuel I of Sardinia resigned in 1821 in consequence of a revolutionary movement. William I of the Netherlands resigned (1840) in great measure by reason of his mortification at the disastrous results of his policy regarding Belgium. Foreign force compelled the abdication of Augustus the Strong of Poland (1706), and later, that of Stanislaus Leszczyński (1735) and of Poniatowski (1795), as well as that of Charles IV of Spain (1808), and of Napoleon (1814 and 1815). Insurrections have been the most frequent cause of forced abdications. The early history of the Scandinavian kingdoms abounds in instances. In England the compulsory abdication of Richard II (1399) is an early example. More recent times saw Charles X of France (1830) and Louis Philippe (1848) retire before the storm of revolution. The abdication of Ferdinand of Austria (1848) was a consequence of the events of the year of revolutions; that of Charles Albert of Sardinia (1849) of the battle of Novara. Of several cases among German princes, the chief is that of Ludwig of Bavaria (1848). Amadeus, King of Spain, felt himself obliged to give up his crown on Feb. 11, 1873. Prince Alexander of Bulgaria was compelled in 1886 to relinquish his principality, and three years later King Milan I of Servia, worried by domestic troubles and beset by internal dissensions in his kingdom, left the throne to his son Alexander I. On Feb. 12, 1912, the Emperor Hsuan-Tung was forced by revolution to abdicate the Imperial throne of China. In some countries the king can abdicate whenever he pleases; but in England, the constitutional relation between the crown and the nation being of the nature of a contract, the king or queen, it is considered, cannot abdicate without the consent of Parliament. It is, however, said that the king does abdicate, or, to speak perhaps more correctly, an abdication may be presumed, and acted on by the people, if his conduct politically and overtly is inconsistent with, and subversive of, the system of constitutional government of which the qualified monarchy of his office forms part. At the conference between the two Houses of Parliament previous to the passing of the statute which settled the crown on William III, it would appear that the word "abdicated" with reference to King James II was advisedly used instead of "deserted"—the meaning, it is presumed, being that King James had not only deserted his office, but that by his acts and deeds, of which the said desertion formed part, he had, in view of the Constitution, ceased to have right to the throne. From this it may be inferred that abdication was considered to have a twofold political significance, involving maladministration as well as desertion. The Scottish convention, however, more vigorously and distinctly resolved that King James "had forefaulted [forfeited] the crown, and the throne was become vacant."

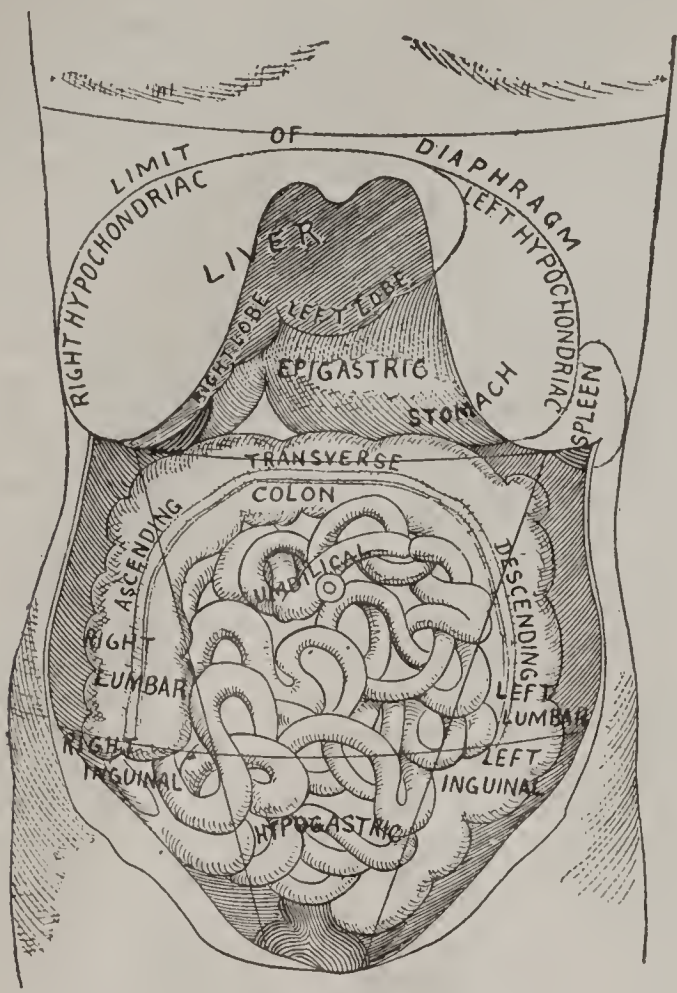
ABDI-CHIBA, äb'dê-chê'bâ. A governor of Jerusalem in the time of Amenhotep IV (1403-1385 B.C.). If correctly read, his name probably designates him as a "servant of Hadad," the storm-god; but it possibly was pronounced "Arta-hipa," and may have been of Mitanian origin (compare Pu-hipa, Tadu-hipa, Gilu-hipa). Among the letters found at El Amarna, the site of Amenhotep's capital, Akhetaton, in 1888, Abdi-chiba was the author of at least six (179-

184, ed. Winckler) and possibly of two more (185, 186). He is also mentioned in a letter of Shuwardata (165). These letters are written in cuneiform characters and in a Babylonian dialect that was no doubt spoken by a part of the population in Syria. Abdi-chiba apparently came from a family that had reigned over Jerusalem before the Egyptian conquest, as he repeatedly reminded Amenhotep of the fact that his father and mother had not made him a ruler, but the strong arm of the great King, probably Amenhotep III, had given him the territory of his ancestors, who may have been Mitanians or Hittites. With his neighbors, Shuwardata at Kilti-Keilah and Milkili at Gath, he was often at war. He was accused by them of having plotted with the Khabiri and taken possession of Kilti, while he charged them with the capture of Bit Ninib, a town belonging to the country of Urusalim, and with betraying the land into the hands of the Khabiri. These were, perhaps, the Hebrews in the widest sense, including Israelitish, Edomitish, Moabitish, and Ammonitish clans. The term Abiru probably means simply a 'nomad,' a 'wanderer.' Neither the Egyptian resident nor the King himself seems to have trusted Abdi-chiba, and the correspondence leaves it doubtful whether the relief he asked for was finally granted. These Amarna letters have been published by Winckler, in *Der Thontafelfund von El Amarna* (Berlin, 1889-90), and *Keilinschriftliche Bibliothek*, vol. v (1896), and by Knudtzon, "Die el-Amarna Tafeln" in *Vorderasiatische Bibliothek* (1908-11). They have also been translated or discussed by Halévy in *Journal Asiatique* (Paris, 1891) and in *Revue Sémitique* (Paris, 1893), by Zimmern in *Zeitschrift für Assyriologie* (Leipzig, 1891, vi, 245-263), by Jastrow in *Journal of Biblical Literature* (Boston, 1892, 95-134) and *Hebraica*, ix, 24-46 (Chicago), by Delattre in *Revue des questions historiques* (Paris, 1896), by Eduard Meyer in *Ægyptiaca* (Berlin, 1897), by Breasted, *History of Egypt* (1905), and by Dhorme in *Revue Biblique* (1908), pp. 500 ff., (1909) pp. 50 ff., 368 ff.

ABDIEL, äb'dî-ël (Heb. 'abd, servant + 'ël, god). In *Paradise Lost*, the faithful angel who opposed the revolt in heaven begun by Satan.

ABDO'MEN. The lower cavity of the human body. The trunk of the human body is divided by the diaphragm into two cavities—the upper being the thorax or chest, and the lower the abdomen or belly. Both the cavity and the viscera it contains are included in the term "abdomen." It contains the liver, pancreas, spleen, and kidneys, as well as the stomach, small and large intestine. The lower bowel, the bladder, and internal organs of generation lie in the lowest part of the cavity, which is called the pelvis. The abdomen is lined by a serous membrane, the peritoneum, which is folded over the viscera, allowing them a certain freedom of motion, but keeping them in their proper relations to each other. For convenience in locating its contained organs, the abdominal cavity is divided into nine regions, by planes, located by imaginary lines drawn on the surface of the body. Two horizontal lines divide it into three segments, and these are each subdivided by two vertical lines into three other segments. The three regions in the median line, from above downward, are named the epigastric, umbilical, and hypogastric. The three regions on each side, named in the same order, are the hypochondriac,

lumbar, and iliac. The abdominal viscera are subject to many acute and chronic affections, to which reference is made under their respective headings.



ABDOMEN

Abdomen. In entomology, the last of the three parts into which the body of an insect is divided. It is composed of a number of rings or segments, frequently nine, more or less distinct from each other. It contains a portion of the intestines and the sexual organs. In the perfect insect its segments bear no legs or wings; but the hind legs of larvæ or caterpillars, which afterward disappear, are attached to them. In many insects its last segments bear appendages of various uses and forms, as pincers, stings, borers, or ovipositors, etc. See ANATOMY and authorities there referred to.

ABDUCTION. In its broadest sense, the unlawful taking or detention by force, fraud or persuasion of a person, as a wife, child or ward, from the custody or control of the person legally entitled thereto. The English common law treated the act as a tort or private wrong to the husband, the parent, the guardian and gave to the injured party an action for damages. The term is, however, generally used, in a more restricted sense to denote the criminal offense of forcibly taking away or detaining a woman for the purpose of marriage or of prostitution. As distinguished from kidnapping (q.v.) the crime has been defined by statute in England for more than 500 years. It is also a matter of statutory definition and regulation in this country. Under these statutes it has been generally held that it is immaterial whether the woman abducted was at the time of chaste character or not. The tendency of our legislation is to extend the scope of the term far beyond its common law limits. For example, many statutes declare that a person receiving or harboring a female under the age of 16 years for the purpose of prostitution is guilty of abduction. Nor is his ignorance of the girl's age any defense to the abduction. Under early English statutes, abduction, as therein defined, was a felony with-

out benefit of clergy (q.v.). In this country it is a crime, punishable by imprisonment for a term of years or by a heavy fine or by both. (See KIDNAPPING; CONSENT, AGE OF; WHITE SLAVERY.) Consult the authorities under CRIMINAL LAW; also Wharton, *A Treatise on Criminal Law* (San Francisco, 1912), and Bishop, *New Criminal Law* (Boston, 1900).

ABD-UL-AZIZ, äb'dul-ä-zëz' (1830-76). Thirty-second Sultan of the Ottoman Empire. He was the second son of Mahmud II and succeeded his brother Abd-ul-Medjid, June 25, 1861. He placed the government in the hands of two ministers, Fuad and Ali, both of reforming tendencies, largely reduced his own civil list, and aroused hopes of an improvement in the condition of his Empire. But he soon lapsed into reckless extravagance, and the projected reforms proved meaningless and ineffective. In 1867 he made a tour of Europe, visiting the Paris Exposition and several capitals, in which he spent a vast amount of money to little purpose. In 1868 he reorganized the council of state, and promised more reforms in response to the demand of the Powers; but the revolt in Crete took his attention, war with Greece was probable, and the state of the treasury precluded efficient reform. The Greek difficulty was arranged by a conference at Paris. Ismail Pasha, Khedive of Egypt, took advantage of the Sultan's financial embarrassment to obtain important concessions, among them a new law of succession for his house, and nearly all the prerogatives of an independent sovereign. The Sultan's affairs grew desperate. The friendship of France had been Turkey's main reliance during the Second Empire. When that fell in 1870, the rival Russian influence became powerful at Constantinople. When the revenues were so low as barely to pay interest on the public debt, a revolt began in Herzegovina (1875) and soon extended to Bosnia. A renewed and more imperative demand of the Powers for radical reforms was embodied in the "Andrassy note" (Dec. 30, 1875), and the progressive constitutional party (Young Turkey) demanded the Sultan's abdication. He was deposed by the council of ministers May 30, 1876, and on June 4 was found dead in his apartments, having presumably cut his own arteries with a pair of scissors.

ABD-UL-HAMID, äb'dul-hä-mëd', I (1725-89). Sultan of Turkey and son of Ahmed III. He succeeded his brother, Mustapha III, in 1774. He was twice involved in wars with Russia. By the treaty of Kutchuk-Kainardji in 1774 he was compelled to relinquish his suzerainty over the Crimea and other Tatar regions. In 1788 the town of Otchakov was stormed by the Russians, a humiliation which is said to have hastened his death. Consult Assim Taxischi, *History of Abd-ul-Hamid and Selim III* (Constantinople, 1867).

ABD-UL-HAMID II (1842-). Thirty-fourth Sultan of the Ottoman Empire; second son of Abd-ul-Medjid. He was born Sept. 22, 1842, and succeeded to the throne Aug. 31, 1876, on the deposition of his elder brother, Murad V. Abd-ul-Hamid came to power at a trying time. The insurrection in Bosnia and Herzegovina was gaining strength, Servia had declared open war upon Turkey, and Russia was fomenting the spirit of dissatisfaction in the Slav states tributary to Turkey. The party of Young Turkey, led by Midhat Pasha, attempted

to establish a parliamentary government and to escape European control just when the aid of Europe was needed against Russia. The savage measures taken to suppress the revolt in Bulgaria and the failure of all Turkish promises of reform quickly alienated the Powers, who gave Russia a free hand. The Czar declared war in April, 1877, a Russian army at once invaded Turkey and advanced almost to Constantinople. Turkey was saved only by European jealousy of Russia. The treaty of San Stefano between the belligerents was materially modified by the Congress of Berlin (q.v.), but even then Turkey lost its remaining claims to suzerainty over Montenegro, Servia, and Rumania, yielded all real sovereignty in Bulgaria, Bosnia, and Herzegovina, and lost some of its territory in Asia Minor. The Sultan was bound by the treaty to introduce reforms in the Christian provinces, but he failed to do this and adopted a distinctly reactionary policy. He took into his own hands the direction of the council of ministers and made his government a personal one. The Armenian outrages from 1895 to 1896 at first aroused the signatory powers of the Berlin treaty to action, but the international relations at the time were complicated, and Abd-ul-Hamid pursued the policy he has always so well understood of eluding all demands for redress or reform by means of promises and excuses, playing off the rival Powers against one another in the meantime. In 1897 a rising in Crete, brought on by Turkish misgovernment, was assisted by Greece and led to war between that country and Turkey. (See GREECE.) European Turkey continued in the meantime in a state of chronic unrest with serious revolts in Macedonia and Albania. Reform plans proposed by Austria and Russia were reluctantly yielded to by the Sultan; they were not executed. A second reform promise was similarly kept. In 1905 Great Britain put forward further proposals. The Sultan reluctantly yielded and in the same year narrowly escaped assassination. Three years later the smoldering forces of discontent broke out in Constantinople itself. The Sultan was forced by the "Young Turk" or reform party to restore the constitution of 1876, and shortly afterwards Abd-ul-Hamid opened the Turkish Parliament. In 1909 a counter-revolution, apparently engineered by the Sultan, proved a failure. A "Young Turk" army marched on Constantinople and deposed him, sending the ex-ruler and his harem to Salonika. Thence on Nov. 2, 1912, he was conveyed back to Constantinople on a German warship and shut up in a palace on the Asiatic side of the Bosphorus. Consult Bérard, *La Turquie et l'Hellénisme contemporain* (Paris, 1893) and *La politique du sultan* (Paris, 1897); McCullagh, *The Fall of Abd-ul-Hamid* (London, 1910).

ABDULLAHI IBN SEYID MOHAMMED, äb'dul-lä'hê 'b'n sä-yêd' mô-häm'mêd. See KHALIFA.

ABD-UL-MEDJID, äb'dul-me-jêd' (1823-61). Sultan of the Ottoman Empire from 1839 to 1861. He succeeded his father, Mahmud II, at a time when the Turkish Empire was threatened by the ambition of the great Viceroy of Egypt, Mehemet Ali. The army had been defeated and dispersed by the Egyptians in the battle of Nisib, June 24, 1839, and there was nothing to hinder the victorious Ibrahim Pasha from advancing on Constantinople, where a large

party was favorable to the elevation of Mehemet Ali to the sultanate. The intervention of the Christian Powers saved the house of Osman. The treaty of July, 1840, from which France kept aloof, rescued the young Sultan from sure destruction. Mehemet Ali had to submit, Nov. 27, 1840, to the restriction of his power to Egypt; and the treaty of July, 1841, to which France subsequently adhered, settled the future dependent relation of Egypt to Turkey. The Sultan, though not very energetic in body or mind, proceeded in the path of reform begun by Selim III and Mahmud II. In this he had for his chief adviser Reshid Pasha, an intelligent and humane Mussulman educated in France. The aim of all his measures was to place the Ottoman population on a footing with the civilized inhabitants of the west. A proclamation of the rights of all subjects, irrespective of creed, was issued in the *hatti-sherif* of November, 1839. This was followed by numerous reforms in all departments, and in 1850 the adherents of all religions were decreed equal in the eye of the law. The good purpose of these decrees was obstructed by the illiberal Moslems, and they remained practically a dead letter. In 1850 the Sultan, in spite of the menaces of Russia and Austria, refused to give up Kossuth and the other Hungarian refugees. The Sultan had a specially difficult part to play during the war with Russia (1853-56) and the diplomatic negotiations consequent to it. Abd-ul-Medjid was the thirty-first sovereign of the race of Osman. He died June 25, 1861, and was succeeded by his brother, Abd-ul-Aziz (q.v.). See OTTOMAN EMPIRE.

ABD UR RAHMAN, äb'dur-rä'män (1778-1859). Sultan of Fez and Morocco from 1823 to 1859. He was the rightful heir to the throne when his father died, in 1794, but was superseded by an uncle, after whose death he ascended the throne. The first four years of his reign were occupied in quelling insurrections. Austria refused to pay the tribute for safety against pirates; but the Sultan wisely adjusted the dispute by relinquishing this sort of blackmail, formerly levied on European ships in the Mediterranean. The war waged by Abd el Kader (q.v.) against the French in Algeria involved the Sultan in its events. He was overwhelmed by Bugeaud in the battle of Isly (1844), and forced to turn against Abd el Kader. The Sultan was a zealous Mussulman without the fanaticism common among his countrymen; as a ruler he was strict and often cruel. He was succeeded by his eldest son, Sidi-Mohammed (1803-73).

ABD UR RAHMAN (ABD AL-RAHMAN) KHAN, kân (1830-1901). Ameer of Afghanistan (q.v., paragraph on *History*) from 1880 to 1901. In the confusion succeeding the death of his grandfather, Dost Mohammed (q.v.) (1863), he supported the pretensions of his father, Afzul, against his uncle, Shere Ali, who had been named as his successor by the late ameer. The rebellion was at first successful, and Abd ur Rahman was installed as Governor of Balkh, where he showed himself a wise ruler. In 1868 Shere Ali overthrew his rivals, and Abd ur Rahman took refuge in Russian territory, living at Samarcand upon a liberal Russian pension. In 1879 he returned to his old province of Balkh, which had always been well disposed toward him. Yakub, the son of Shere Ali, who had been set up as ameer by the English and then

left to shift for himself, was unable to maintain order, and a new war with the English was followed by his deposition. Abd ur Rahman, in July, 1880, was recognized as ameer by the leading chiefs and was confirmed by the Anglo-Indian government, from whom he received a subsidy of £160,000 a year and much in the way of military equipment. It had been feared from his previous relations with Russia that he would be favorable to Russian designs; but he at once resumed the pro-English policy of his grandfather, and, by a firm and skillful control of the tribes of his realm, preserved the integrity of Afghanistan and maintained peaceful relations with his powerful neighbors. In 1893 the mountainous district of Kafirstan, in the Hindu Kush, was ceded to him by the Anglo-Indian government, and in 1896 he completed the subjugation of the tribes inhabiting it. He was an intelligent, well-meaning ruler, of a masterly habit, which stood him in good stead in dealing with his half-barbarous people. He was made by the British government a Grand Commander of the Star of India, and also G. C. B. He died October 3, 1901, after a brief illness, and was succeeded by his eldest son, Habib Ullah (q.v.), who for some time had borne an active part in the government and shown much administrative ability. See **AFGHANISTAN**. Consult: J. A. Gray, *At the Court of the Ameer* (London, 1895); Wheeler, *The Ameer Abdurrahman* (London, 1895); Mohammed Khan (Mir Munshi Sultan), *The Life of Abdur Rahman, Ameer of Afghanistan* (London, 1900).

ABECEDARIANS, ā'bê-sê-dā'rī-anz (Lat. *abecedarius*, pertaining to the alphabet, with reference to the first four letters). Followers in 1522 of Nikolaus Storch, a clothmaker of Wittenberg, a disciple of Luther, who imbibed enthusiastic views commonly called Anabaptist. They also believed it was best not to know how to read, since the Holy Spirit would convey knowledge of the Scriptures directly to the understanding, and, as education might be a hindrance to salvation, they encouraged pupils to leave the schools and universities and learn trades.

A'BECE'DARY CIR'CLES. Rings of letters described around magnetized needles, by looking at which friends at a distance were supposed to be able to communicate with each other.

A BECK'ET, THOMAS. See **BECKET, THOMAS**.

A'BECKETT, ARTHUR WILLIAM (1844-1909), son of Gilbert Abbott A'Beckett. An English journalist, novelist, and dramatist, born in London. In early life he edited the *Glowworm* (1865-68) and the *Britannia Magazine* (1868-70). During the Franco-Prussian War he was special correspondent for the *London Standard* and *Globe*. In 1874 he became a member of the staff of *Punch*, on which he remained until 1902. For the next two years he edited *John Bull*. Among his publications are *Modern Arabian Nights* (1885); *The Modern Adam* (1899); *London at the End of a Century* (1900); *The A'Becketts of Punch* (1903); *Recollections of a Humorist* (1907).

A'BECKETT, GILBERT ABBOTT (1811-56). An English humorous writer, born in London. He became a lawyer and during the last seven years of his life was a metropolitan police magistrate, in which office he displayed marked ability. He also devoted much of his time to

literature, was the founder of *Pigaro in London*, the precursor of *Punch*, and became one of the original staff of the latter. He wrote more than 60 plays, and with Mark Lemon dramatized *The Chimes* and other works of Charles Dickens at the author's request. He was the author of the *Comic History of England* (new ed., 1907); *Comic History of Rome* (1852); *Comic Blackstone* (1869). Consult *The A'Becketts of Punch* (1903) by his son, Arthur William.

A'BECKETT, GILBERT ARTHUR (1837-91). An English journalist and dramatist, son of Gilbert Abbott A'Beckett (1811-56). He was born in London and studied at Westminster School and Christ Church, Oxford. He wrote many successful songs, and the librettos of *Canterbury Pilgrims* and *Savonarola*, operas by Dr. Villiers Stanford, and was joint author, with Herman Merivale, of the poetic drama entitled *The White Pilgrim*. During the last 12 years of his life A'Beckett was one of the best-known contributors to *Punch*.

ABEDNEGO, a-bēd'nē-gō. The name given in Babylon to Azariah, one of the companions of Daniel (Dan. i. 7 ff.). It is probably an intentional change from Abd Nebo, 'servant of Nebo,' or Abd Nergal, 'servant of Nergal.'

ABEEL, á-bēl', DAVID, D.D. (1804-46). An early missionary to China. He was born in New Brunswick, N. J., June 12, 1804; graduated from the theological seminary of the Reformed Dutch Church in his native town, and became pastor in Athens, Greene Co., N. Y., 1826. Failing health compelled his resignation after two years and a half; in 1829 he went to China as chaplain in the employ of the Seamen's Friend Society; in 1830 was transferred to the American Board of Commissioners for Foreign Missions. He traveled extensively through the Far East, and on his way home invalided he went over Europe and excited great interest in missions there, as he did later in America (1833-36). Again thinking himself well enough for service, he returned to China in 1838, but was compelled by his increasing debility to return home (1845) and died in Albany, N. Y., Sept. 4, 1846. As one of the earliest and most devoted of missionaries he is still remembered. His addresses in London led to the formation of the Undenominational Society for Promoting Female Education in the East (1834); in 1844 he founded the Amoy Mission, now under the Reformed Dutch Church Foreign Mission Board. He published *Journal of a Residence in China* (New York, 1834; 2d ed., 1836); *The Missionary Convention at Jerusalem, or An Exhibition of the Claims of the Word of the Gospel* (1838). For his biography, consult G. R. Williamson (New York, 1848).

A'BEL (Heb. *hēbēl*, probably akin to Aramaic *habbala*, 'herdman'). According to Gen. v. 2, the name of the second son of Adam and Eve. The first-born, Cain (q.v.), settled down to agricultural life; the younger brother became a shepherd. At the close of the year, Cain offered up of the fruits of the field as a sacrifice to God, but Abel brought the firstlings of his flock. While the latter's gift was accepted by the Deity, not a glance was bestowed on the offering of the former. In consequence of this Cain's jealousy was aroused, and he slew his brother Abel. The story is generally understood by modern scholars as referring to two tribes in the Negeb (q.v.), north of Kadesh-

Barnea (q.v.), and as emphasizing the contrasts, shown in their history, between the nomadic, the pastoral or semi-nomadic, and the agricultural life. The Judæan story-teller looked back on Abel as a lost tribe destroyed by Cain, or the Kenites (q.v.). At his own time the latter were wandering nomads, having no share in the cultivated land and living without the privileges and protection of its sanctuaries. (See ASYLUM.) This condition was felt to be abnormal and therefore a punishment for past crimes. It was inferred that they must once have been tillers of the soil but had been driven out into the wilderness because of their manner of worship and their treatment of Abel. Fruits of the field, cereals and wine, had been their offerings, but these things had not been acceptable, had brought no prosperity. On the other hand, the tribe of Abel had prospered, their animal sacrifices being graciously received. Jealous of this prosperity, the Kenites had finally violated their covenant with Abel and caused this tribe to perish. The *huwe*, or brother-relation, between a pastoral and a farming tribe, still existing between certain tribes of *badwin* (see BEDOUIN) and *fellahin* (see FELLAH), implies the duty of the latter to furnish bread-stuff to the former in lieu of protection against enemies. The extermination of Abel, however, has been sufficiently punished by the hard life the Kenites had to lead in the land of Nod (q.v.), and there should be no feud between them and the Judæans, seeing that they had received a sign (probably circumcision, q.v.) as a protection against further vengeance for Abel. It has been suggested by Winckler that the tribe of Abel once occupied the district around Maon and Carmel (q.v.), that this was appropriated by the Kenites, who laid it under cultivation, and that they were themselves later driven out of it. So far as Abel is concerned this is not improbable. Underlying the story is the conception of the semi-nomadic or pastoral life as intrinsically nobler and more pleasing to God than either the farmer's life or that of the wild nomad. This is reflected in the implied disapproval of vine culture in the tale of Noah's drunkenness (Gen. ix. 20-21), in many utterances of pre-exilic prophets, and in the story of the Rechabites (q.v.) who had followed the commandment of their ancestor not to build or live in houses, not to plant or own vineyards or drink wine, and not to sow seed or possess a field. Even in later thought Abel remained the type of the true worshiper, and his animal sacrifice was regarded as better than Cain's (Heb. xi. 4); he was himself looked upon as the righteous man, the possessor of true faith, in contrast to Cain the wicked (Matt. xxiii. 35; Luke xi. 51; 1 John iii. 12). In the *Testament of Abraham* Abel plays the part of judge of the nether world. Whether this later development of the figure was due to identification with some chthonic deity cannot be determined. The proposed connection with Tammuz as the 'son,' Bab. *aplū*, can scarcely be maintained. There is a manifest relation between Abel and Jabal (q.v.); while the explanation of the name as meaning 'breath,' 'vanity,' has no value. See the important article by B. Stade, "Das Kainszeichen" in *Zeitschrift für Alt-testamentliche Wissenschaft* (1894, pp. 250 ff.); H. Winckler, *Geschichte Israels* II (1900, pp. 189 ff.); Ed. Meyer, *Die Israeliten und ihre Nach-*

barstämme (1905, pp. 393 ff.); N. Schmidt, *The Messages of the Poets* (1911, pp. 291 f.).

ABEL, CARL, Ph.D. (1837-1906). A German philologist. He was born in Berlin, and after studying at the universities of Berlin, Munich, and Tübingen, acquired familiarity with all European and several Oriental tongues. He was at one time a lecturer at Oxford, taught philosophical and comparative linguistics at the Humboldt Academy of Science at Berlin, and was linguistic assistant in the German Foreign Office. His publications in German, French, and English are numerous. The works include *Linguistic Essays* (1880), *Slavic and Latin*, the Ilchester lectures on comparative lexicography delivered at Oxford (1883), *Russland und die Lage* (1888), and *Letters on International Relations before and during the War of 1870* (London, 1871), which created some attention at the time.

ABEL, Sir FREDERIC AUGUSTUS (1827-1902). An English chemist. He was born in London and devoted himself chiefly to the science of explosives. He was consulting chemist to the British War Department from 1854 to 1888. Abel introduced important improvements in the manufacture of gun-cotton and of blasting gelatine, and with James Dewar invented cordite, the standard explosive of the British War Department. He published *Gun-cotton* (1866); *The Modern History of Gunpowder* (1866); *On Explosive Agents* (1872); *Researches in Explosives* (1875), and *Electricity Applied to Explosive Purposes* (1884). He wrote also, in conjunction with Colonel Blexam, a *Handbook of Chemistry* (1854).

ABEL, JOHN JACOB (1857-). An American physiological chemist. He was born in Cleveland, Ohio, received his education at the University of Michigan, and studied medicine in Germany. On his return to this country he became connected with the Johns Hopkins University, where he was made professor of pharmacology in the medical school and head professor of physiological chemistry. Dr. Abel's researches have formed valuable contributions to our knowledge of the fluids and tissues of the animal body.

ABEL, ä'bël, KARL FRIEDRICH (1725-87). A German musician and composer, celebrated as the last virtuoso on the viola da gamba. He was born at Cöthen, became a pupil of Sebastian Bach, and was a member of the Royal Polish Orchestra at Dresden. He went to England in 1759 and six years later became chamber musician to Queen Charlotte. Together with John Christian Bach (the London Bach), a son of Sebastian, he directed the subscription concerts, known as the Bach-Abel Concerts, from 1765 to 1782. His works comprise 37 symphonies, string quartets, trios and sonatas for piano.

ABEL, ä'bël, NIELS HENRIK (1802-29). One of the most brilliant mathematicians of the first part of the nineteenth century. He was born at Findöe, Norway. After a course of study at the University of Christiania, he spent two years in Paris and Berlin and in 1828 was made instructor at the university and at the military school in Christiania. He was the first to demonstrate with rigor the impossibility of solving by the elementary processes of algebra general equations of any degree higher than the fourth. His chief contributions were made to the theory of functions, of which he was one of the

founders. An important class of transcendental functions (see FUNCTIONS) are known as Abelian, from their discoverer. There are also Abelian equations, groups and bodies. The binomial theorem (q.v.), proved by Newton and Euler, received at the hands of Abel a wider generalization, including the cases of irrational and imaginary exponents. Abel's works, in two vols., were published by the Norwegian government (Christiania, 1st ed., 1839; 2d ed., 1881).

ABÉLARD (Engl. äb'ë-lärd; Fr. ä'bä'lär'), **PIERRE** (1079–1142). A scholastic philosopher and theologian, the boldest thinker of the twelfth century. His name is commonly given in the French form, Abélard or Abailard; in Latin, Abailardus or Bajolardus. But these are epithets of uncertain meaning, the latter form perhaps from *bajulus*, 'teacher,' the former from *abeille*, 'a bee.' He had properly the single name Peter, *Petrus*, to which was added *de Palais*, from the place of his birth, Le Pallet, or in Latin form Palatinus, a village 8 miles southeast of Nantes, Brittany, western France. He was born in 1079. His father was the knight Berengar, lord of the village; his mother was Lucia, and they both later on entered monastic orders. An irrepressible thirst for knowledge and a special pleasure in scholastic logic moved Abélard to resign his rights of primogeniture in favor of his younger brothers. His first teacher was Roscellin, the Nominalist, during the latter's stay at Vannes. He wandered about in search of knowledge until he arrived in Paris, where he became a pupil of William of Champeaux, the Realist, the head of the cathedral school of Notre Dame there, but soon incurred the hatred of his master, whom he puzzled by his wonderful subtlety. He fled to Melun, where he started a school of his own, and afterward to Corbeil, admired, yet persecuted, wherever he went. He then returned home for the restoration of his health. With renewed strength, he returned to Paris, reconciled himself with his opponents, and molded, by his influence as a lecturer, some of the most distinguished men of his age, among whom were the future Pope Celestine II, Peter Lombard, Berengar, his future apologist, and Arnold of Brescia.

At this time, however, there also lived in Paris with her uncle, the canon Fulbert, Héloïse, the 18-year-old natural daughter of a certain canon John, of Paris, already remarkable for her beauty, talents, and attainments. At Fulbert's invitation Abélard made his home with him and instructed Héloïse. She soon kindled in the breast of Abélard, then 38 years old, a violent and overwhelming passion, which was returned by Héloïse with no less fervor. The lovers were happy together until Abélard's ardent poetical effusions reached the ears of the canon. He sought to separate the lovers, but it was too late. They fled together to Abélard's home, where, in his sister Dionysia's house Héloïse gave birth to a son and was privately married to Abélard with the consent of her uncle. Not long after, Héloïse returned to Fulbert's house and denied the marriage, that her love might be no hindrance to Abélard's advancement in the church. Enraged at this, and at a second flight which she took with Abélard to the Benedictine nunnery at Argenteuil, where she had been educated, a flight which Fulbert interpreted as showing Abélard's desire to rid himself of his wife,

Fulbert, in order to make him canonically incapable of ecclesiastical preferment, caused Abélard to be emasculated. In deep humiliation Abélard entered as a monk the abbey of St. Denis, in Paris, and induced Héloïse to take the veil at Argenteuil.

But the lectures which he began to give soon after exposed him to new persecutions. The synod of Soissons (1121) declared his opinions on the Trinity to be heretical. In punishment he had to throw the offending treatise into the fire, to read publicly the Athanasian Creed, and to endure a brief imprisonment. The charge seems to have been that he declared God the Father alone omnipotent. But what cost him more was his declaration that St. Dionysius, the patron saint of France, had been bishop of Corinth, and not of Athens, for this stirred up court opposition. He fled from St. Denis to the monastery of St. Aigulph, near Provins, but was brought back and compelled to retract his opinions concerning St. Dionysius. He was then allowed to go, and went to Nogent-sur-Seine, and there built of reeds and rushes a little chapel to the Trinity, and later, on account of the press of hearers, who planted their huts about him, a structure of wood and stone, which he called the Paraclete, the ruins of which exist to this day. But as everything he did caused adverse criticism, so the name that he gave the building—because it brought into unusual prominence the Holy Spirit—involved him in fresh trouble, and he left the Paraclete and accepted the abbotship of St. Gildas de Rhuys, on the coast of Lower Brittany. It was a sore trial for him to contend with the unruly monks. Meanwhile, the convent at Argenteuil, where Héloïse was prioress, had been broken up. Abélard transferred Héloïse and her nuns to the Paraclete and made her abbess of the nunnery he established. It was a long distance from St. Gildas, but, as spiritual director, he frequently went thither. Naturally, he fell under suspicion of renewing his intimacy with Héloïse, and so the lovers finally restricted themselves to writing. The correspondence has been preserved. On his part it was sternly repressive, to the point of coldness; on her part the heart expressed its love, which was an inextinguishable passion, both of body and soul, and tyrannical in its demands upon the monk who had ceased to share it.

After ten more years, Abélard, fearing an attack upon his life, left his monks and became a wandering teacher again. Two men, Norbert and the much more famous Bernard of Clairvaux, were always on his track. The Council of Sens, held in 1141, under the influence of Bernard, condemned his teachings. Abélard appealed to the Pope, Innocent II, and the latter confirmed the finding of the council and ordered his imprisonment and the burning of his writings. Abélard submitted; reconciled himself with Bernard, and was on his way to Rome to undergo his punishment, when he came, worn out, to the great monastery of Chuny. Through the friendly offices of Peter the Venerable, its noble abbot, he received permission to retire thither and a release from the order of imprisonment. He had not long to live, but the time was well spent in religious exercises and in occasional teaching. He had the scurvy, and when his ills increased he was removed to the priory of St. Marcel at Chalon-sur-Saône, where the air was better, it was thought. There he

died, on April 21, 1142. His body was brought to the Paraclete. Héloïse died there May 16, 1164, and was laid beside him. In the cemetery of Père-la-Chaise in Paris their bones are now united in one tomb, erected in 1817.

The loves of Abélard and Héloïse have made them immortal, but Abélard also has importance as a philosopher. He followed John Scotus Erigena, the ninth century philosopher, in his rationalism. He planted himself on Aristotelian ground (although all he knew of Aristotle was derived from Latin quotations) and did much to overthrow the prevalent realism. He stated the theory later known as conceptualism, rejecting both nominalism and realism. He held that we come to the conception of the general by thought upon the particular. General ideas are the creation of the intellect and in so far have reality. His great service in the development of ethics was in his treatment of conscience by dwelling upon the subjective aspect. He also has great importance as the virtual founder of the University of Paris, in a sense the mother of mediæval, and so of all modern, universities. This claim may be made for him because he first established schools independent of the monastic and episcopal schools. In Melun, in Corbeil, and then in Paris, at Nogent-sur-Seine, he had thousands of pupils and gave an extraordinary impetus to learning and speculation. His example as an independent teacher was followed. Out of such gatherings of students at a later date the universities were evolved. By his appeal to reason instead of authority, he showed the path to intellectual freedom and thus became the prophet of the freedom of speech and research for which the universities properly stand. In both these respects his pedagogical importance is great, and so his particular opinions and errors are of comparatively small moment.

His works, all written in Latin, first printed at Paris, 1616, are in Migne, *Patrol. Lat.*, clxxviii (Paris, 1855); also as edited by Victor Cousin: *Ouvrages inédits d'Abélard* (Paris, 1836); *Opera* (1849-59, 2 vols.); to which should be added his *Sic et Non*, editors, E. L. T. Henke and G. L. Lindenkohl (Marburg, 1851); *Planctus Virginum Israel super filia Jeptæ Galaditæ*, editors, W. Meyer and W. Brambach (Munich, 1886); *Tractatus de Unitate et Trinitate* [discovered, edited, and published by R. Stölzle under title: *Abélards 1121 zu Soissons verurtheilter Tractatus, etc.*] (Freiburg-im-Breisgau, 1891); his *Hymnarius Paraclitensius*, editor G. M. Dreves (Paris, 1891). The letters of Abélard and Héloïse have very often been published and translated, e.g., the Latin text and the French translation by Gréard (Paris, 1885); complete English translation by J. Berington, with the Latin text, *The History of the Lives of Abeillard and Héloïse* (Birmingham, 1788), edited by H. Mills (London, 1850); O. W. Wight, *Lives and Letters of Abélard and Héloïse* (New York, 1861). Consult: A. S. Richardson, *Abélard and Héloïse* (New York, 1884), with selections from their letters; H. Morton, *Love Letters of Abélard and Héloïse* (New York, 1901), and the standard biography of Abélard by C. de Rémusat (Paris, 1855). For recent literature concerning him, consult: H. Hayd, *Abälard und seine Lehre im Verhältniss zur Kirche und ihrem Dogma* (Ratisbon, 1863); H. V. Sauerland, *Abälard und Héloïse* (Frankfort, 1879); P. Tiby, *Deux couvens au moyen*

âge, ou l'abbaye de Saint Gildas et le Paraclet au temps d'Abélard et d'Héloïse (Paris, 1851); C. A. Wilkens, *Peter Abälard* (Bremen, 1851); C. de Rémusat, *Abélard*, a drama (Paris, 1877); S. M. Deutsch, *Abälards Verurtheilung zu Sens, 1141, nach den Quellen kritisch dargestellt* (Berlin, 1880); E. Vacandard, *Abélard, sa lutte avec Saint Bernard, sa doctrine, sa méthode* (Paris, 1881); S. M. Deutsch, *Peter Abälard, ein kritischer Theologe des zwölften Jahrhunderts* (Leipzig, 1883); A. Hausrath, *Peter Abälard* (Leipzig, 1893); G. Compayré, *Abélard and the Origin and Early History of Universities* (New York, 1893); F. Thaner, *Abälard und das canonische Recht* (Graz, 1900); J. McCabe, *Peter Abélard* (New York, 1901). See also R. L. Poole, *Illustrations of the History of Mediæval Thought* (London, 1884); Rashdall, *Universities in the Middle Ages* (Oxford, 1895).

ABELE, à-bēl'. See POPLAR.

ABELIN, ä'be-lën, JOHANN PHILIPP (?-c.1635). A German historian. He wrote under the names Philipp Arlanibäus, Abeleus, and Johann Ludwig Gottfried, or Gothofredus. He produced a number of works still consulted, including the *Arma Suecica* (1631-34), and the *Inventarium Sueciæ* (1632), descriptions of military events of the time. He also founded the *Theatrum Europæum* (1635-1738), an illustrated serial work on contemporary history, for which he compiled the first two volumes. Others of his publications are a *Historische Chronika* (1633) and an *Historia Antipodum* (1655). See Droysen, *Arlanibäus, Godofredus, Abelinus* (1864).

ABELITES, ä'bēl-its, or **ABELONIANS**, äb'ë-lō'nī-anz. A very small Christian sect of the fourth and fifth centuries, found in the neighborhood of Hippo, in north Africa. Their chief distinction consisted in marrying but abstaining from matrimonial intercourse, in order not to propagate original sin. They kept up their numbers by adopting children. They held that Abel so lived, because the Bible mentions no children of his. They are noticed by Augustine, *De Hæresibus Liber*, and in an anonymous work, *Prædestinatus*.

ABEN, ä'bën. A form used in the transliteration of Oriental names instead of the more correct *Ibn* ('son').

ABENCERRAGES, ä-bën'se-rä'jes; *Sp. pron.* ä-bän'sä-rä'häs. According to legend, a noble Moorish race whose struggles with the family of the Zegrîs and tragical destruction furnish the material for the historical romance *Las guerras civiles de Granada*, by Gines Perez de Hita (Saragossa, 1595). From this Chateaubriand composed the novel *Le dernier des Abencérages*. There was actually a family of Abencerrages, powerful in the first quarter of the fifteenth century, but their history has been so embellished by legend that it is difficult to say what is true and what is imaginary.

ABEN-ESRA, ä'bën ëz'rà, or **IBN EZRA**, properly ABRAHAM-BEN-MEIR-IBN-ESRA (1092-1167). One of the most learned Jews of his time. He was born in Toledo, Spain. He died Jan. 23, 1167. He was master of the Hebrew, Arabic, and Aramaic languages; had considerable knowledge of mathematics, astronomy, and medicine; was a scientific observer and a poet and generally distinguished himself as a sagacious thinker. He visited Lombardy, Provence, France, Egypt, and England, and passed the later years of his life in Rome, everywhere

teaching grammar, theology, astronomy, etc., besides writing works on Hebrew grammar and composing numerous poems. His *Commentaries on the Old Testament* are the most important of his works, though his scientific method occasioned opposition upon the part of the Talmudists. He also produced some treatises on astrology, since published in Latin. The scholastic writers mention Aben-Esra as ABENARE or AVENARD. An English translation of his *Isaiah* has been made by M. Friedländer (London, 1873), of his *Canticles* by H. J. Mathews, with original text in Friedländer, *Miscellany of Hebrew Literature*, vol. ii (London, 1877).

ABENSBERG, ä'bëns-bërk. A town in Lower Bavaria, Germany, situated 18 miles southwest of Ratisbon and 1200 feet above sea level. It has warm springs and ruins of a castle. On April 20, 1809, Napoleon here defeated the Austrians and opened the way for the victory of Eckmühl. Pop., 2300.

ABEOKUTA, ä'bâ-ô-kôô'tâ. A city in Egba-land, a division of Yoruba, on the Slave Coast, north of Lagos, with which it is connected by rail. It is situated on an elevated plain, on the banks of the Ogun River, and is surrounded by a high mud wall. It occupies an extensive area, but its general appearance is that of a very large village. Abeokuta was founded about 1825 as a result of the slave-hunting expeditions of the natives of Dahomey and Ibadan. It was founded primarily on the lines of a confederation for mutual protection, each tribe, however, preserving its individual rights and customs. The population has been variously estimated, but British figures, returned in 1911, show 51,000 inhabitants, most of whom are artisans and traders and show much skill in their buildings and textiles. There is considerable commerce in manufactured goods from Europe which are exchanged for products of the surrounding region, cotton being the most important.

ABERAVON, äb'ër-ä'von. A seaport on Glamorgan county, Wales, 11 miles by rail southeast of Swansea, on the river Avon (Map: England and Wales, C 5). In the Vale of Avon are found coal, iron, and copper, and the principal industry of the town and immediate district is metal working. There is here a Cistercian monastery of the thirteenth century. Pop., 1901, 7553; 1911, 10,505.

ABERBROTHWICK, äb'ër-bröth'ik. See **ARBROATH**.

AB'ERCARN (Celtic *aber*, confluence of rivers + Gael. *carn*, a conical heap of stones). A town in Monmouthshire, England, 5½ miles southwest of Pontypool. It is a progressive municipality, owning waterworks and cemeteries. Pop., mostly engaged in coal mining and metal working, 1891, 10,400; 1901, 12,607; 1911, 16,445.

ABERBROTHWICK, äb'ër-bröth'ik. See **ABERCROMBY, JAMES**.

ABERCROMBIE, JOHN (1780-1844). An eminent Scotch physician. He was born at Aberdeen and graduated in medicine at Edinburgh in 1803. He practiced his profession in the Scottish capital and soon became recognized as the first consulting physician in Scotland. Among the honors bestowed upon him were the degree of M.D. from Oxford, the rectorship of Marischal College, the vice-presidency of the Royal Society of Edinburgh, and the office of physician in ordinary to His Majesty for Scotland. Besides his professional writings he pub-

lished *Inquiries concerning the Intellectual Powers* (Edinburgh, 1830), and *Philosophy of the Moral Feelings* (London, 1833), both of which attained a remarkable popularity. They championed the views of the Scotch school as represented by Dugald Stewart, but had no originality and therefore have now little philosophical value.

ABERCROMBIE, JOHN WILLIAM (1866—). An American educator, born at Kelly's Creek, Ala., and graduated from Oxford College (1886) and the law school of the University of Alabama (1888). Immediately following his college course he served as President of Ashland College and at the close of his legal studies as principal of Cleburne Institute, both in his native State. A period of two years (1890-91) as president of Bowdon College, Ga., was succeeded by six years as superintendent of schools in Anniston, Ala. In 1897 he was appointed president of the Southern Female Seminary (now the Anniston College for Young Ladies); in 1898, Alabama State superintendent of education; and in 1902, president of the University of Alabama. His interest in politics resulted in his election (1896 and 1898) to the State Senate, where he was made chairman of the committee on education. Of the National Education Association Abercrombie was a director (1900-04) and vice president (1903-04); and of the Southern Educational Association president (1905-06). He became, also, a member and officer in several other national and State educational associations and commissions. The *Biennial Report* of the Department of Education of Alabama, for 1899-1900, and several articles and pamphlets on educational subjects, were prepared by him. He received the degree of LL.D. from the University of Alabama in 1904 and the University of South Carolina in 1905. He was elected to the Sixty-third Congress in 1912.

ABERCROMBY, äb'ër-krüm'bī, or **ABERCROMBIE, JAMES** (1706-81). A British soldier, born at Glassbaugh, Scotland. He entered the army as colonel in 1746, and was raised to the rank of major-general and sent to America in 1756, where in 1757 he replaced Loudon as commander-in-chief of the British and colonial forces. On July 8, 1758, at the head of 15,000 men, he attacked Ticonderoga (q.v.), but was repulsed with a loss of fully 2000 men. This attack was the culmination of a career of incapacity, and in September he was superseded by Sir Jeffrey Amherst. Returning (1759) to England, he became a member of Parliament, and was conspicuous as an upholder of George III's colonial policy. For his record as an officer in America, consult Parkman, *Montcalm and Wolfe* (Boston, 1884).

ABERCROMBY, Sir RALPH (1734-1801). A distinguished British general. He was born at Menstry, near Tullibody, Scotland, October, 1734. He was educated at Rugby and studied for the legal profession at Edinburgh and Leipzig, but preferred the army, and a cornet's commission was obtained for him in 1756. In 1758 he accompanied his regiment to Germany, where he saw active warfare and gained experience in army management. At the conclusion of peace he was stationed in Ireland for several years. He married in 1767 and by 1773 had risen to the rank of lieutenant-colonel. He entered Parliament and strongly opposed the American war, a course particularly honorable, as he desired active service. The war with France gave him

his opportunity. Family influence and his reputation procured his promotion to be major-general of a brigade ordered to Flanders, where he distinguished himself so highly as to be publicly thanked by the Duke of York. Under him the Duke of Wellington, then Lieutenant-Colonel Wellesley, commanding the Thirty-third Regiment, received his baptism of fire. Abercromby was knighted on his return to England in 1795, and was surprised to find himself famous as his country's greatest general. The disastrous campaign, however, had shown him the deterioration in army discipline, and his energies were devoted to the reorganization of the whole army system. In 1796 he conducted a successful expedition to the West Indies. In 1797 he went to Ireland as commander of the forces. He strongly condemned the governmental policy toward that country, however, and this caused his resignation; but he was at once given a similar appointment in Scotland. In 1799 he was placed in command of the expedition to Holland and began it brilliantly; but he was superseded by the Duke of York, and the campaign ended ignominiously. Abercromby alone acquitted himself with credit, and the ministry wished to make him a peer, but he refused to have his name associated with a failure. In 1800 he commanded the expedition to the Mediterranean and after some brilliant operations defeated the French in the battle of Alexandria, March 21, 1801. During the action he was struck by a musket-ball in the thigh; but not until the battle was won and he saw the enemy retreating did he show any sign of pain. The ball could not be extracted; mortification ensued, and seven days later, on March 28, 1801, he died. Abercromby was at once gentle and brave, clear-sighted and cool in deliberation; in action, prompt and daring. Apart from his qualities as a soldier, he was a man of liberal accomplishments, free from prejudices, and of sound practical judgment. The national gratitude to this eminent man took the form of a peerage conferred on his widow, afterward enjoyed by his eldest son, with the title of Baron Abercromby. Consult: J. Abercromby, *Memoir of the Life of Sir R. Abereromby* (Dublin, 1801); J. Abercromby, Baron Dunfermline, *Memoir of Lieutenant-General Sir Ralph Abereromby* (London, 1861).

ABERDARE, äb'ër-dâr'. A town in Glamorganshire, Wales, on the right bank of the Cynon, 4 miles southwest of Merthyr-Tydfil (Map: Wales, C 5). It is situated in a rich mineral district, having extensive coal, iron, and tin works. Aberdare has canal and railway connection with the coast; much coal is exported, and its growth has been remarkable. From an unimportant village of 6500 inhabitants in 1841 it has developed into a thriving town of 38,431 in 1891, 43,365 in 1901, and 50,844 in 1911.

AB'ERDEEN' (Celtic *aber*, confluence of waters, i.e., of the Don and Dee). The fourth largest city of Scotland, and the county town of Aberdeenshire. It is situated in the southeastern part of the county, on the North Sea, about 130 miles by rail north of Edinburgh (Map: Scotland, F 2). It forms the chief part of a parliamentary burgh of the same name and comprises the territory between the rivers Dee and Don, thus including what was formerly known as Old Aberdeen; the district of Torry in Kincardineshire, south of the Dee, was incorporated with the city in 1891. Aberdeen has a

mean temperature of about 46° F. and is about 66 feet above sea level. It is a handsome city, largely built of granite quarried in the neighborhood, and is therefore known as the "Granite City." The streets are mostly regular and well paved. Union Street, its principal thoroughfare, has been described as one of the handsomest streets in Europe and contains many notable buildings, including the Town and County Bank and the Palace Hotel. Of first importance are the Municipal and County Buildings (in Castle Street, a short easterly extension of Union), an imposing structure in the Scotch baronial style, built in 1867-78. Near by is "The Cross," a curious monument adorned with medallions of Scottish monarchs. At the western end of Union Street are the Music Hall buildings, particularly notable in point of architecture, and the Trades' Hall, in which are kept the shields of the different incorporated trades. Several of the bank buildings are tasteful edifices. Notable in architectural merit are the new buildings of Marischal College in Broad Street, opened in 1906. The East and West churches, although comparatively modern, are interesting from the fact that they are built on the site of the ancient church of St. Nicholas and are connected by an old wooden tower. Among the many other churches of Aberdeen the Roman Catholic church is notable for its beautiful spire, 200 feet high, and the cathedral of St. Machar, begun in 1357, for its severe simplicity of style. The river Dee is crossed by four bridges, one of which, a stone bridge, dates from 1527.

The city has an excellent harbor with immense floating docks and a breakwater, enabling it to carry on a large maritime trade in textile goods, agricultural products, and granite. It is a large manufacturing centre, the chief industries including cotton spinning, manufacture of cotton, woolen, and linen goods, iron founding, and paper making. Granite cutting and shipbuilding are also quite important, although the latter industry has diminished since the days of wooden vessels, when the Aberdeen clippers were famous. The deep-sea fisheries are important. Aberdeen's means of communication are excellent. It is at the junction of three railway lines, and is connected by steamer with Leith, Newcastle, Hull, and London. Its own shipping comprises about 180 steam and 40 sailing vessels, tonnage about 100,000. In 1911 the net tonnage entered at the port was 201,508, and cleared 32,194; while the net tonnage of vessels arriving was 1,041,424, and departing, 1,020,498. The chief exports are fish, spirits, cloth manufactures, coal products, stone, etc., and the chief imports barley, wheat meal, maize, oats, flaxseed, sugar, timber, paper-making materials, etc. In 1911 imports were valued at £1,163,618, and exports at £1,496,670. Aberdeen is the fifth port of importance in Scotland. The United States is represented there by a consular agent.

Aberdeen sends two members to Parliament and is one of the most progressive of municipalities. It has the usual authorities, consisting of a lord provost, bailies, councilors, etc. (See GREAT BRITAIN, paragraph on *Government*.) The city owns and operates its water and gas works and an electric light plant, as well as its electric tramways, and maintains public baths, markets, and two cemeteries. It has taken up the question of the proper housing of the working people, and as a result has established a lodging house and erected several

workingmen's dwellings. Aberdeen's educational institutions are numerous, and include the University of Aberdeen (q.v.); among the other colleges and schools are Robert Gordon's College, which receives a yearly grant from the city; an art school; a navigation school; an ancient grammar school dating from 1263, the United Free Church College, a divinity school with a library of 30,000 volumes; the Mechanics' Institute; and the Aberdeen and North of Scotland College of Agriculture, which was founded in 1904 and had in 1913 an enrollment of about 600. Among the benevolent and charitable institutions are the Royal Infirmary, an epidemic hospital and one for incurables, a large lunatic asylum, and a poorhouse. The city has two fine public parks. Aberdeen appears in the twelfth century as a populous town. William the Lion granted it a charter in 1179, and Robert Bruce extended its privileges. The English burned the town in 1336, but it was rebuilt as New Aberdeen. It suffered severely during the civil wars of the seventeenth century. A period of great prosperity began in 1818, with the rediscovery of the art of granite polishing. Aberdeen is a royal, parliamentary, and municipal burgh; pop. of the municipal burgh in 1891, 121,905; 1901, 153,503; 1911, 163,891.

ABERDEEN. A city and the county-seat of Monroe Co., Miss., about 141 miles by rail southeast of Memphis, Tenn., on the Frisco Lines, the Illinois Central, and the Mobile and Ohio railroads, and on the Tombigbee River (Map: Mississippi, J 3). It has an oil mill, grist mill, cotton gins, and manufactures clothing, cotton-seed oil, wagon spokes, and barrel staves, and buttons. It is an important cotton market. The city owns the waterworks and electric light plant. Pop., 1900, 3434; 1910, 3708; 1913 (est.), 4500.

ABERDEEN. A city and the county-seat of Brown Co., S. D., 280 miles west of Minneapolis, Minn., on the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, the Minneapolis and St. Louis, and the Great Northern railroads (Map: South Dakota, F 2). It has a public library, a fine municipal building, two daily newspapers, a court house, an opera house, a Federal building, five inside rest parks, and is the seat of a state normal and industrial school. The city has important commercial interests, and manufactures flour, soft and pressed brick, chemicals, candies, grain bins, clothing, and artesian well supplies; there are also several grain elevators and creameries. Settled in 1880, Aberdeen was incorporated in 1882, and has since adopted the commission form of government. The waterworks are the property of the municipality. Pop., 1890, 3182; 1900, 4087; 1910, 10,753; 1913 (est.), 14,500.

ABERDEEN. A city in Chehalis Co., Wash., 50 miles (direct) west of Olympia, at the head of Grays Harbor; on the Chehalis River; on the Northern Pacific and Chicago, Milwaukee, and St. Paul railroads; and on the line of the Oregon and Washington Railway and Navigation Company; two steamship lines connect it with Californian ports (Map: Washington, B 4). The city is rapidly growing on account of its extensive lumber industry and abundant natural resources. The surrounding region is rich in dairying products. Among the city's industries are logging, lumber, and shingle mills, cooperages, shipyards, and fish and clam packing-houses. Aberdeen owns and operates its water-

works. Pop., 1890, 1638; 1900, 3747; 1910, 13,660; 1913 (est.), 17,500.

ABERDEEN, fourth EARL OF, GEORGE HAMILTON GORDON (1784-1860). A British statesman, born at Edinburgh. He was educated at Harrow, and in 1804 took the M.A. degree at St. John's College, Cambridge. In 1801 he had succeeded to the earldom and made a journey through Greece, which is perpetuated by Byron's satirical distich,

"First in the oat-fed phalanx shall be seen
The traveled thane, Athenian Aberdeen."

He was elected a Scotch representative peer and took his seat as a Tory in December, 1806. In 1813 he was appointed Ambassador Extraordinary to Austria, where he gained the friendship of Metternich, whom he considered a pattern of diplomacy. He signed the Treaty of Paris as one of England's representatives. He was raised to the peerage as Viscount Gordon. He was Foreign Secretary under Wellington, 1828 and 1830, and under Peel, 1841 to 1846, in 1834 and 1835 acting as Peel's War Secretary. The general principle which guided his policy as Secretary of State and Foreign Affairs was that of non-interference in the internal affairs of foreign states, which, joined to his well-known sympathy with such statesmen as Metternich, exposed him—not always justly—to the suspicion of being inimical to the cause of popular liberty. His gradual abandonment of high Tory principles was evinced by his support of the bill for the repeal of the test and corporation acts and of the Roman Catholic Emancipation Act. The conclusion of the Chinese War, the Ashburton Treaty, and the Oregon Treaty were the principal services rendered to the country during his administration. In 1852, on the resignation of Lord Derby, the extraordinary state of parties necessitated a coalition, and Lord Aberdeen was selected as Prime Minister. The ministry which he headed was composed of many of the most brilliant men in England, among them Russell, Palmerston, and Gladstone; but the feeble and vacillating policy displayed in the conduct of the war with Russia gradually undermined its stability, and the disastrous mismanagement brought to light in the winter of 1854, in all departments of the public business connected with the war, filled up the measure of popular discontent and led to his resignation in 1855. He died in London. Consult Gordon, *Earl of Aberdeen* (London, 1893).

ABERDEEN, GEORGE GORDON, EARL OF (1637-1720). A Lord Chancellor of Scotland. He was educated at King's College in Aberdeen and was professor there in 1658. He became an advocate in 1668 and entered the Scottish Parliament in the following year. From 1682 to 1684 he was Lord Chancellor, and later was an active leader in Parliament (1685-86). The revolution that placed William on the throne aroused his opposition, but he finally submitted after the accession of Anne.

ABERDEEN, ISABEL MARIA, COUNTESS OF (1857—). A British social worker and author. She is the youngest daughter of Dudley Coutts Majoribanks, first Baron Tweedmouth, an eminent banker, and was born at "Guisachan," Inverness-shire, Scotland. In 1877 she was married to the seventh Earl of Aberdeen (q.v.). She early became interested in social and philanthropic work, especially in behalf of her own sex, and before 1893 was elected president of

several women's associations in Great Britain, including the Scottish Mother's Union, the Women's Local Government Society, the Women's Liberal Federations of England and Scotland. She founded the Onward and Upward Association, an organization for promoting a more sisterly interest among women of every station in life, and especially between mistresses and their female servants. In 1886, during her husband's first term as Lord Lieutenant of Ireland, she founded the Irish Industries Association. During 1893-98, when her husband was Governor-General of Canada, she founded the National Council of Women and the Victorian Order of Nurses. During 1893-99 she was president of the International Council of Women and was reelected in 1904. In 1913 she visited the United States, and while here studied American methods of social work. She is the author of *Through Canada with a Kodak; Our Lady of the Sunshine* (1910), and edited the proceedings of *The International Congress of Women* (1900) and *Ireland's Crusade against Tuberculosis* (3 vols., 1908).

ABERDEEN, JOHN CAMPBELL GORDON, first MARQUIS OF (1847—). A British statesman. Educated at St. Andrews and Oxford; in 1880 was appointed Lord Lieutenant of Aberdeenshire, and from 1881 to 1885 was Lord High Commissioner to the General Assembly of the Church of Scotland. From January to July, 1886, he was Lord Lieutenant of Ireland, from 1893 to 1898 Governor-General of Canada, and in 1905 became Lord Lieutenant of Ireland on the accession of the Liberals to power, resigning in December, 1914. Consult Justin McCarthy, *British Political Portraits* (1903).

ABERDEEN, UNIVERSITY OF. A university at Aberdeen, Scotland, consisting of two colleges, King's and Marischal. The first of these, known at one time as the College of St. Mary and later as King's College, was founded by the Bishop of Aberdeen, William Elphinstone, as early as 1494; the second, always known as Marischal College, was founded by Earl Marischal of Scotland, George Keith, in 1593. The two colleges led a separate existence up to 1858, when, by an act of Parliament, they were united into the University of Aberdeen. It is a coeducational institution, having between 1200 and 1300 students, and still retains some of the traditions of the mediæval university. There are the customary five faculties of arts, science, law, theology, and medicine, taught by some 30 professors and many assistants. At present the Faculty of Arts, which includes courses for teachers, has the largest number of students (over 450), with the Faculty of Science ranking second in popularity. The work of the university is carried on in two different centres, its buildings being located in separate sections of the city. Besides enjoying State and private endowments, the University of Aberdeen is a beneficiary of the Carnegie Trust Fund. Thanks to these heavy endowments, it has several important museums and a library of over 140,000 volumes.

AB'ERDEEN'SHIRE. That county of Scotland which projects farthest northeast into the North Sea (lat. 57° 40' N.). It comprises the drainage basins of the rivers Don and Ythan, and the greater part of the Dee basin (Map: Scotland, F 2). It is popularly divided into five districts, Mar, Strathbogie, Garioch, Formartine, and Buchan, and has an area of 1971

square miles. Among the principal towns are Aberdeen, the capital, Peterhead, and Fraserburgh. The chief industries are connected with agriculture and sea fisheries. Most of the manufactures, among which may be mentioned paper milling, centre about Aberdeen. Fine granite is quarried. Pop., 1801, 121,100; 1901, 304,439; 1911, 312,177. Consult A. Smith, *History of Aberdeenshire* (Aberdeen, 1875).

ABERDOUR. A village in Fifeshire, Scotland, 18 miles by rail northwest of Edinburgh. Its pleasant situation on the shore of the Firth of Forth has made it a favorite sea-bathing resort. It has ruins of a Norman church and of an old castle. About a mile off shore is the island of Inchcolm (q.v.). Pop., 1901, 1997; 1911, 2147.

ABERGAVERNNEY, äb'ër-gän'nî, or äb'ër-gäv'n'nî (the Roman *Gobannium*). A market town of Monmouthshire, England, 13 miles by rail west of Monmouth, beautifully situated in the valley of the Usk, where it joins with the Gavenny (Map: England, D 5). The town is regularly and compactly built, and many improvements have of late years been made. It was incorporated in 1899. St. Mary's Church, which was once a fine cruciform structure containing many interesting monuments, has been spoiled by restorations. The castle, built by Hammeline de Baladun, soon after the Conquest, is now a ruin. There are quarries, collieries, and iron works in the neighborhood, and it is also a fishing centre. Pop., 1891, 7700; 1901, 7795; 1911, 8511.

AB'ERNE'THY. A village in Perthshire, Scotland, on the Tay, about 6 miles southeast of Perth (Map: Scotland, E 3). It is believed to have been the metropolis of the Picts, and for many years in the ninth century was the seat of the only bishopric in Scotland. The principal object of interest is an ancient round tower in the churchyard, like which there is only one other in Scotland. Pop., 1901, 1276; 1911, 1267.

ABERNETHY, JAMES (1815-96). A Scotch civil engineer. He was born at Aberdeen. In 1841 he was resident engineer of the Aberdeen harbor works, and from 1842 to 1852 was surveying officer for the Admiralty. He was the first to apply hydraulic power to the working of lock-gates and constructed such important works as the Birkenhead docks, the Hull Alexandra docks, and the Turin and Savona Railway (Italy). He was also the director of the works for the draining of Lake Abukir, Egypt, by which 20,000 acres were reclaimed. In 1881 he was elected President of the Institute of Civil Engineers.

ABERNETHY, JOHN (1680-1740). An Irish dissenting minister. He was born at Colerain, Ireland, the son of a dissenting Presbyterian minister; was educated at Glasgow and Edinburgh, and was licensed to preach before he was 21 years old. He was ordained at Antrim in 1703; in 1717 he was invited to a congregation in Dublin and another in Belfast, while Antrim desired him to remain. The synod was appealed to and decided that he should go to Dublin, but he declined and remained at Antrim. This refusal to obey the synod was unheard of and was considered ecclesiastical rebellion, and a fierce controversy ensued, the parties dividing into "subscribers" and "non-subscribers." Though himself strictly evangelical, Abernethy and his associates were

remotely the occasion of the contest which ended in eliminating Arian and Socinian elements from the Irish Presbyterian Church. In 1726 Abernethy and all the "non-subscribers" were turned out with due ban and solemnity, but only four years afterward he was called to a "regular" congregation in Dublin. In 1731, in the controversy regarding the test act, Abernethy took broad ground "against all laws that, upon account of mere differences of religious opinions and forms of worship, excluded men of integrity and ability from serving their country." He was a century ahead of the time and had to argue against those who denied that a Roman Catholic or a dissenter could be a "man of integrity and ability." Abernethy was foremost where unpopular truth and right were to be maintained, and his *Tracts*, collected after his death, did good service for generations. He died in Dublin, December, 1740. Consult Drechal, *Sermons of John Abernethy, with his Life* (London, 1748-51).

ABERNETHY, JOHN (1764-1831). An eminent English surgeon. He was born in London. He was a pupil of John Hunter; in 1787 was appointed assistant surgeon of St. Bartholomew's Hospital, and in 1815 chief surgeon. Soon after his appointment he began to lecture in the hospital on anatomy and surgery and may be said to have laid the foundation of its character as a school of surgery. His clear, simple, and positive style, illustrated by an inexhaustible variety of apt anecdotes, made him the most popular medical teacher of his day. In 1813 he was appointed surgeon to Christ's Hospital, and in 1814 professor of anatomy and surgery to the Royal College of Surgeons. His practice increased with his celebrity, which the singular eccentricity and occasional rudeness of his manners contributed to heighten. He made a great improvement on John Hunter's operation for the cure of aneurism by tying the external iliac artery. Of his works, the most important are his *Observations on the Constitutional Origin and Treatment of Local Diseases* (1806) and his *Lectures on the Theory and Practice of Surgery* (1830).

ABERRATION, CHROMATIC (from Lat. *ab*, away + *errare*, to wander, and Gk. *Χρῶμα*, *chrōma*, color; literally, colored deviation). A phenomenon observed when images of an object emitting white light are formed by a lens or a prism, it being observed that there is then not one white image, but many colored ones, which do not occupy the same position and which are of different sizes, thus producing a blurred image with a colored border. It is explained in the article LIGHT that the sensations of different colors are due to waves in the ether of different wave-number or wave-length, and that these waves, in passing through portions of transparent matter, such as glass, travel with different velocities, depending upon their wave-number. As a consequence of this, in passing through lenses or prisms, waves of different wave-number have different paths. White light is shown to be due to the reception by the eye of waves of different wave-number; or, in other words, from a "white object," or an object "emitting white light," waves of different wave-numbers proceed outward. These waves are such that each train of waves of a definite wave-number would produce in the eye a definite color-sensation, e.g., blue, green, etc. In this sense we may speak of "blue-waves," "green-

waves," etc.; and in general white light is due to the reception by the eye of waves which correspond to the "colors of the spectrum"—violet, blue, green, yellow, orange, red, and all the intermediate shades. Therefore, owing to this difference in path in a lens or prism of waves of different color, if an image of a white object is formed there will be a series of images corresponding to the different colors, these images differing in position and size as well as in color. This result is said to be due to the "chromatic aberration" of the lens or prism. (There are, of course, ether-waves which do not affect the sense of sight; and any prism or lens

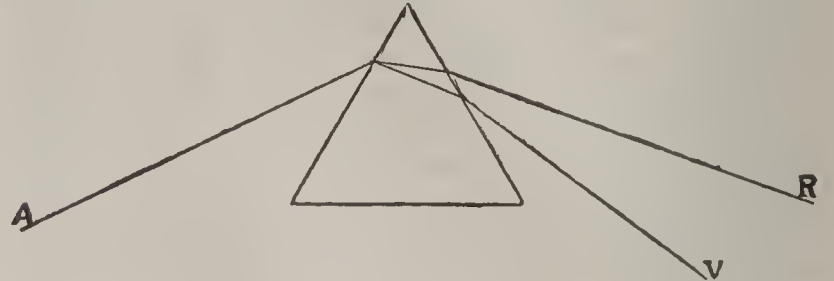


FIG. 1.

which is transparent to them will in general deviate waves of different wave-number differently, and so have this same kind of aberration, as ordinary glass lenses have for visible waves.) Mirrors do not have chromatic aberration, as there is no refraction of the rays. Moreover, it is possible, by combining two or more prisms or lenses, to diminish greatly the aberration. (See ACHROMATISM.) The colors which are not thus brought to the same focus form the "secondary spectrum."

Reference to the diagrams will possibly serve to explain the matter more fully. Fig. 1 shows the dispersion (q.v.) of a beam of white light on passing through a prism, or, in other words, its separation into its constituent colors.

In fig. 2 let *MN* represent a convex lens, which may be considered as consisting of a num-

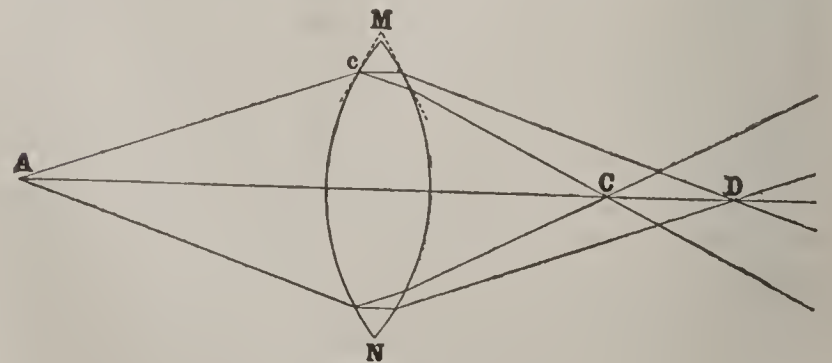


FIG. 2.

ber of prisms and having the same dispersive effect. Let *A* represent a source of white light. Considering a pencil which falls on the lens at *c*, where it is refracted, it is found that dispersion takes place, and the red rays after being deviated proceed to *D*, where an image of the object *A* is formed, while the violet rays which undergo greater refraction proceed to *C* and there form an image of the object *A*. Consequently, if the image at *C* is examined with an eye-piece, or allowed to fall on a screen, it will be found to have a red border, while that at *D* will be seen surrounded by violet. When correction is made for chromatic aberration, the purpose for which the lens is designed must be considered. (See TELESCOPE.) For photographic work the violet rays are required, and any correction (see ACHROMATISM) should aim to bring them to the desired focus. For a visual telescope

or microscope the yellow rays must be considered, and such a combination of lenses made that they are brought to the same focal plane. The chapters on optics in Müller-Pouillet's *Lehrbuch der Physik* (Brunswick, 1897) treat the subject most fully, as does Glazebrook's *Physical Optics* (London, 1898). The correction of this evil in photographic lenses is extensively treated from the theoretical standpoint in S. P. Thompson's translation of Lummer's *Photographic Optics* (London, 1900). See also Wood's *Physical Optics* (New York, 1905); Blein, *Optique geometrique* (Paris, 1913); Percival, *Geometrical Optics* (New York, 1913); Nutting, *Outlines of Applied Optics* (Philadelphia, 1912).

ABERRATION, SPHERICAL. A term used in geometrical optics (see LIGHT) to express the difference in path and effect of rays of light incident perpendicularly and obliquely upon a mirror or upon a surface separating two portions of transparent matter, e.g., upon a surface of water. If a source of light is very small, it can be called a "point-source" and can be considered as sending out "rays of light" in all directions, like the radii of a sphere. If one of these rays is perpendicular to the surface of the mirror or to the surface of separation of the two media, the rays near this will form a small cone or "pencil of rays"; and in optics it is shown that such a perpendicular pencil of rays always gives rise by reflection or refraction to another pencil of rays which meet in a point called the "image" or "focus" of the point-source. If, however, a small cone or pencil of rays be chosen around a ray which falls obliquely on the mirror or separating surface, it will give rise by reflection or refraction to rays which do not form a cone and therefore do not have a point as a focus, except in the case of a plain mirror, such as an ordinary looking-glass. If the incident pencil is narrow, the reflected or refracted rays will have two foci, in the form of two short, straight lines, some distance apart and perpendicular to each other. These are called "focal lines"; and in between them the rays come the closest to forming a point focus, producing what is called the "circle of least confusion." If, instead of considering a narrow pencil of rays, we study the whole bundle of rays falling on the entire reflecting or refracting surface, it is evident that the rays have a real or virtual focus on a surface which can be thought of as due to the combined effect of the short focal lines produced by the individual pencils of which the bundle of rays is composed, and which has a cusp or projecting point ending at the point-focus due to the perpendicular pencil. A section of this "caustic surface" is often seen on looking down on a cup of coffee or a glass of milk, if there is a lighted lamp near; because the projecting sides of the cup or glass act as a curved mirror. An immediate consequence of spherical aberration is that the image formed of any object by a curved mirror or by a lens or prism is not "sharp," but blurred, unless care be taken to exclude the oblique rays. This is done ordinarily by the use of diaphragms, such as are seen in opera-glasses, photographic lenses, etc. The smaller the opening in the diaphragm, so much the sharper is the image. See CAUSTIC.

The accompanying diagrams will show the effect of spherical aberration in the case of spherical and parabolic mirrors and convex lenses. In Fig. 1 parallel rays are incident on a spherical mirror. Those falling perpendicu-

larly, i.e., near the centre of the mirror, O , are reflected to the point Q , which is termed the principal focus of the mirror. The rays which strike the surface more obliquely do not meet at Q after reflection, but at points which lie on the caustic surface whose section is represented by the heavy line with a cusp at Q . In Fig. 2 the elimination of spherical aberration by the use of a parabolic mirror is shown, as here, by the peculiar property of a parabola (q.v.), all rays parallel to the axis are brought to a point at F , called the

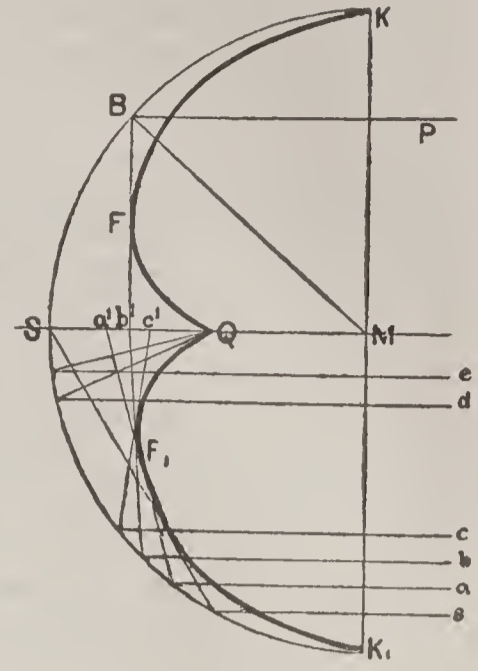


FIG. 1.

focus. For this reason the parabolic mirror is theoretically the most available for telescopes (q.v.), but in practice the construction of such mirrors presents great difficulties, which are but rarely effectually surmounted. The effect of spherical aberration in the case of a lens is indicated in fig. 3, where the rays passing

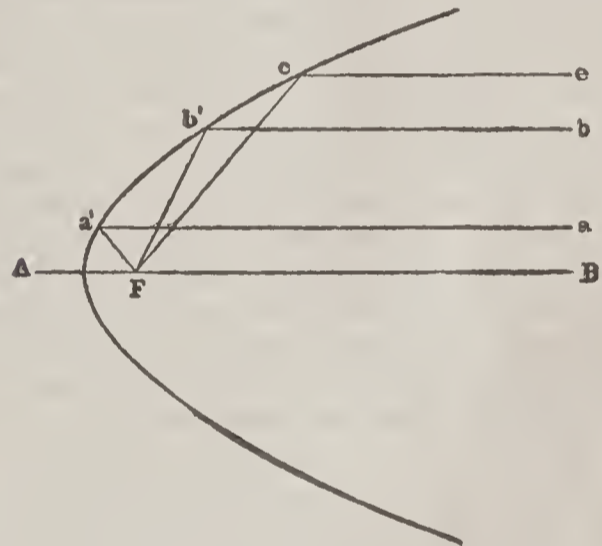


FIG. 2.

through the lens near its circumference are brought to a focus at C , while those lying nearer the axis AB meet at or near F . The foci for intermediate rays lie between that point and C . From these diagrams the advantages obtained by the use of diaphragms will be seen. The oblique rays, or those which strike the mirror or

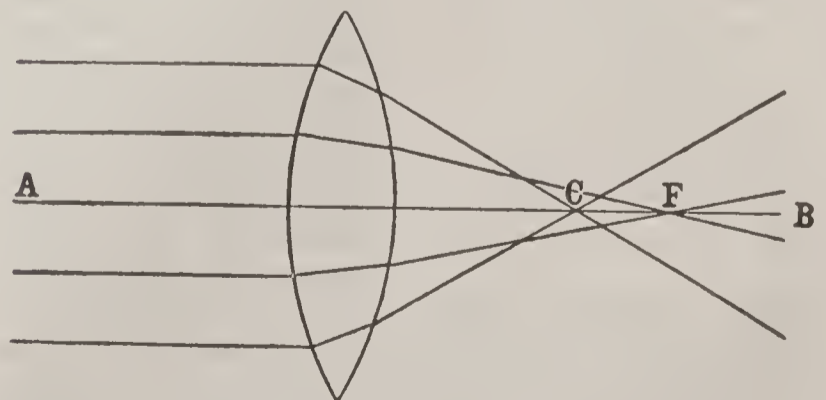
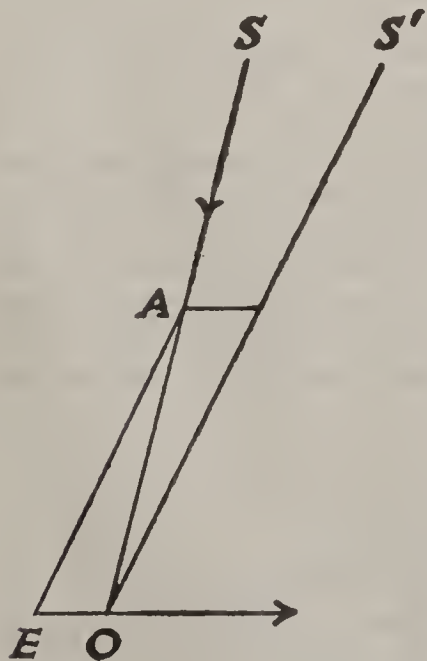


FIG. 3.

lens at a distance from its centre and which do not come to a focus at the same point as those passing through the central portion, are accordingly cut off and the image rendered more

distinct. The spherical aberration of lenses can be reduced by using two or more lenses in combination, as is done in the case of most photographic objectives. Two lenses with equal focal lengths can be combined, and their effect is the same as a lens with one-half the focal length, while the spherical aberration is greatly diminished. The books of reference mentioned under ABERRATION, CHROMATIC, will also supply ample information on this subject.

ABERRATION OF LIGHT. The displacement of the apparent direction of a heavenly body, due to the effect of the earth's motion on the direction of the relative velocity with which the light of the heavenly body approaches the earth. The phenomenon of aberration arises from the fact that light requires appreciable time for its transmission through space. The motion of light traveling from a star or a planet toward the earth, combined with the earth's own motion, causes an apparent displacement of the stars on the sky; they all appear to occupy positions a little different from their true ones. In explaining this phenomenon, we often use the analogy of a man running in a rain-storm. Though the raindrops may be falling straight down, they will seem to the running man to descend on his face in a slanting direction. Light, too, may be coming down, as it were, vertically, but as the earth, with the observer on it, is hurrying through space, there will be produced a similar apparent slanting of the light. The accompanying diagram will serve to make this clear: Suppose the light to be traveling from a distant star S in the direction SO ; let the velocity of light be V , and let it be represented in magnitude and direction by the length AO . Suppose also that the earth is moving in the direction EO with velocity v represented by the length EO . Then, if we consider O as a fixed point, the light is approaching O with velocity represented by AO . Also, since the earth is approaching O with velocity represented by EO , the point O may be regarded as approaching the earth with



an equal and opposite velocity which will therefore be represented by OE . Hence the relative velocity with which the light is approaching the earth is the resultant of the two velocities represented by AO and OE . By the principle of mechanics known as the triangle of velocities, this resultant is represented in magnitude and direction by AE . Now the apparent direction of an object is determined by the direction in which the light from the object is moving at the instant it enters the eye of the observer. When therefore the earth has reached O , the star is seen in the direction OS' drawn parallel to EA , although its true direction is OS . Hence the star will be seen on the sky displaced in the direction of the terrestrial motion. But since the motion of our planet takes place in a closed, oval curve, the apparent

displacement of the star is now in one direction, and now in another, corresponding to the directions in which the earth is moving at different points of its oval path. The result is that the star itself seems to move each year through a small curve; and this is a sort of miniature reproduction of the earth's orbit around the sun.

In the explanation just given, we have considered the heavenly body to be one of the fixed stars, and therefore so far distant from the earth that its annual motion relative to that body is inappreciable. When, however, the body under observation is itself in motion with respect to our earth, as is the case with the sun and the other planets of the solar system, a further somewhat analogous displacement is produced. Astronomers therefore need to correct all their observations by a process of calculation, so as to reduce them to what they would be if no such thing as aberration existed.

The Constant of Aberration. The displacement angle SOS' is called the aberration error of the star. The maximum aberration will be observed, in general, twice a year, namely, when the line joining the earth and the star is at right angles to the earth's line of motion, and the angle SOS' in this case is called the *constant of aberration*. It may be shown by trigonometry that the constant of aberration measured in seconds is 206,265 times the ratio of the velocities v and V . The value of this constant, as adopted by the Astronomical Congress at Paris in 1896, is $20''.47$, which is probably correct to within two-hundredths of a second. At any other time the aberration error is found by multiplying the constant of aberration by the sine of the earth's way, the earth's way being the angle OEA , or the angle between the direction of the star and that of the earth's motion. It follows therefore that a star situated at the pole of the ecliptic will appear to describe a small circle of diameter $41''$ on the celestial sphere, since the line joining it to the earth is always at right angles to the direction of the earth's motion, while stars in the ecliptic will oscillate to and fro in straight lines $41''$ long. A star lying between the ecliptic and its pole will appear to describe an ellipse, the longer of whose axes is equal to twice the aberration constant, and the shorter to twice the constant multiplied by the sine of the star's latitude (q.v.).

The particular importance of the constant of aberration is due to the computations rendered possible by a knowledge of its exact value. Its measurement with the utmost possible precision has long been the object of very earnest efforts; and few other astronomical problems have received so much attention in recent years. Combined with the known velocity of light, it gives us the earth's orbital velocity in miles per second. From this we get the length of the annual terrestrial orbit in miles, and then by a simple calculation we find its semi-diameter, or the distance from the earth to the sun. This last is the fundamental unit for astronomical measures of distance, and its exact evaluation is considered the most important of all astronomical problems.

Aberration was discovered by James Bradley (q.v.) in 1725. Hooke had reported the discovery of large parallax in the case of the star γ Draconis, and accordingly, in 1725, Bradley undertook a series of measurements on the star

with a zenith sector for the purpose of verifying Hooke's observation. He found that the latitude of the star underwent small periodic variations during the course of the year, and, moreover, that the displacement was greatest when the parallactic displacement should have been zero. He therefore abandoned all attempts to explain the phenomenon as due to parallax, although its annual recurrence led him to infer that it was in some way connected with the motion of the earth about the sun. It is said that the true explanation was suggested to him in 1728 while sailing on the Thames. He observed that the wind seemed to shift whenever the boat was put about, and was told, on questioning the boatman, that the direction of the wind vane at the head of the mast was due to the motion of the boat as well as to the direction of the wind. This gave him the desired clue, and shortly after, in 1729, he announced his discovery to the Royal Society.

The aberration discussed above may be termed the annual aberration. Besides this, a star suffers diurnal aberration, due to the effect of the earth's diurnal rotation about its axis on the relative velocity of light. The displacement due to this cause diminishes from a maximum of about 0".32 for stations situated on the equator to zero at the north and south poles. There is, moreover, a secular aberration, caused by the translation of the solar system as a whole through space, but since, so far as our present knowledge extends, this motion is in a straight line and its rate is constant, it affects all stars equally, so that their relative positions remain unaltered. All that can be said is that the right ascension and declination of each star are different by constant amounts from what they would be if this aberration were absent. See PARALLAX, section *Solar Parallax*; SUN.

ABERSYCHAN, äb'ēr-sük'an. A town in Monmouthshire, England, about 11 miles by rail north of Newport, in a wild mountainous region, and on the edge of the coal district. Numerous collieries and iron foundries are located here. Pop., 1891, 15,300; 1901, 17,768; 1911, 24,661.

AB'ERT, HERMAN (1871—). A German writer on music. He was born in Stuttgart and received his first musical education from his father, who was first conductor at the court opera. Later he became a pupil of the Stuttgart conservatory. After graduation from the gymnasium he devoted himself from 1890 to 1895 to the study of classical philology at the University of Tübingen, where he received the degree of Ph.D. From 1897 to 1901 he spent at the University of Berlin in research work relating to the history of music. From 1902 to 1909 he was lecturer on music at the University of Halle; since 1909 he has been professor. Besides numerous special studies relating to the history of music contributed to the volumes of the *Internationale Musikgesellschaft* he published: *Die Lehre vom Ethos in der griechischen Musik* (1899); an excellent biography of Schumann in Reimann's series *Berühmte Musiker* (1903); *Die Musikanschauung des Mittelalters und ihre Grundlagen* (1905); *Jommelli als Opernkomponist* (1908).

AB'ERT, JOHN JAMES (1788-1863). An American military engineer. He was born in Shepherdstown, Va., and graduated at West Point in 1811, but resigned from the army and practiced law in Washington. He served as a

private in the battle of Bladensburg, Aug. 24, 1814. Later in the same year he joined the corps of engineers and in 1838 had become colonel in command of the topographical bureau. He was retired in 1861. Colonel Abert exercised an important influence in the development of the earlier engineering works of the government.

AB'ERTIL'LERY. A town in Monmouthshire, England, 4½ miles northwest of Pontypool. It is in the heart of the coal fields, and mining is the occupation of most of the inhabitants. Pop., 1891, 10,850; 1901, 21,945; 1911, 35,425.

ABERYSTWITH, äb'ēr-ist'with. A favorite watering-place, summer resort, and educational centre in Cardiganshire, Wales, on Cardigan Bay, about 50 miles north-northeast of Swansea (Map: Wales, B 4). On a hill above the town stand the ruins of an old castle erected by Gilbert de Strongbow. Adjoining it is the University College of Wales, established in 1872. Pop., 1891, 6700; 1901, 8014; 1911, 8412.

ABERYSTWITH, UNIVERSITY COLLEGE OF. See WALES, UNIVERSITY OF.

ABESHR, ä-běsh'r. The capital of the state of Wadai, in Nigeria, West Africa, about lat. 14° N., long. 21° E. (Map: Africa, G 3). It was once the centre for richly laden caravans from Tripoli, Kano, and the east. Its importance has greatly decreased because of pillage by the inhabitants. Pop., about 10,000.

ABET, **ABET'TOR** (Lat. *a + beter*, to bait or urge on). In criminal law to abet is to encourage, incite, or instigate the commission of a crime. An abettor is an accessory (q.v.) and, by the better opinion, an accessory before the fact.

ABEY'ANCE (OF. *abeiance*, from *a*, Lat. *ad*, at + OF. *beer*, Fr. *bayer*, Middle Lat. *badare*, to gape, to expect). A legal term importing that the title to real or personal property, a dignity, or office is not vested in any one, but is suspended until the true owner appears or the right thereto is determined. Strictly speaking, there could be no abeyance of a freehold at common law. In legal contemplation, there must always be some one in whom a present estate or interest in the land is vested. This, however, did not apply to future estates which might be in abeyance. Thus, when one holds land for life, with remainder to the heir of a living person other than himself, the remainder is in abeyance, since the heirs of that other remain undetermined while he is alive. Titles of honor are said to be in abeyance when it is uncertain who shall enjoy them. Thus, under the English law, when a nobleman leaving a title descendible to his heirs general dies, leaving daughters and no male issue, the King, by his prerogative, may grant the title to any one of the daughters. Until the King exercises his prerogative, the title, which is thus suspended, is said to be in abeyance. See the authorities referred to under the article on PROPERTY.

AB'GAR. A common name or title of several kings of Edessa in northwestern Mesopotamia. One of them is known from an alleged correspondence with Christ. The account given by Eusebius (*Ecclesiastical History*, xiii, i.) states that he sent a letter to Christ requesting him to come to Mesopotamia and heal him. To this Christ made a reply that, although unable himself to come, he would, after his ascension, send

a disciple. Both of these letters Eusebius claims to have found in the archives of Edessa and believes to be genuine. Other versions add that Christ sent to the King a portrait, now displayed at both Rome and Genoa. Consult R. A. Lipsius, *Die Edessenische Abgar Sage* (Brunswick, 1880).

ABHEDĀNANDA, äb'-hä-dä'nān-dā, SWAMI (1866—). A Hindu lecturer and author, born in Calcutta, India, and educated at Calcutta University. He was a disciple of Sri Rāmākṛishna Paramahansa, and became a member of the Order of Sanyāsins, said to be one of the oldest orders of priesthood in the world. In 1897 he removed to the United States, where he delivered lectures on the Vedānta philosophy, organizing and becoming head of the Vedānta Society of New York. He delivered many lectures on Hindu philosophy before educational institutions, societies, etc., and came to be considered one of the leading exponents of Monistic Vedānta in America. Among his published writings are *Reincarnation* (1899); *Spiritual Unfoldment* (1901); *Philosophy of Work* (1902); *How to be a Yogi* (1902); *Divine Heritage of Man* (1903); *Self-Knowledge* (1905); *India and her People* (1906); *Human Affection and Divine Love* (1911); *Great Saviors of the World*, vol. i (1911); and many pamphlets on philosophical subjects.

ABHOR'RERS. In English history, the name given to the Tory element that expressed abhorrence of the petitions presented to Charles II for the reassembling of Parliament (1679) and that upheld the King in his efforts to control public opinion. Their opponents were called Petitioners.

ABI'ATHAR (Heb. 'the excellent one is father'). The high priest whose father, Ahimelech (1 Sam. xxii. 20), or Ahijah, was slain at the command of Saul for having received and helped the fugitive David (1 Sam. xxii. 9-10). In 2 Sam. viii. 17 we should read with the Syriac version "Abiathar, son of Ahimelech," and not, as the Masoretic text, "Ahimelech, son of Abiathar." Abiathar also was a strong adherent of David, and showed his friendship especially during Absalom's rebellion (2 Sam. xv. 29). At a later time Abiathar favored Adonijah (1 Chron. i. 7), and for this Solomon deprived him of his priesthood and banished him to Anathoth (1 Kings ii. 26-33). With his deposition the direct line of Eleazar comes to an end, and the place is taken by Zadok and his descendants (1 Kings ii. 35. See Ezek. xl. 46; xliii. 19; xlv. 15). In our Greek text of Mark ii. 26 Abiathar is given as the name of the priest at Nob who gave David the showbread. But the words "under Abiathar the high-priest" are not found in the Sinaitic Syriac and are probably a later gloss of a reader whose memory failed him. See AHIMELECH.

A'BIB. The older biblical name for the first month of the Jewish ecclesiastical, and the seventh of the civil, year. In this month the feast of Passover is celebrated (Ex. xiii. 4; xxxiv. 18). In the later books of the Bible representing the period when the Babylonian names, together with the Babylonian calendar, were adopted by the Hebrews (Neh. ii. 1; Esther iii. 7), the month is called Nisan, and this name is used at the present time in the official calendar of the Jewish church.

ABICH, ä'bīk, WILHELM HERMANN (1806-86). A German geologist and traveler. He was

born in Berlin. He studied at the university there, in 1842 became professor of mineralogy in Dorpat, and in 1853 member of the St. Petersburg Academy of Sciences. He explored the Caucasus, Russian Armenia, northern Persia and Daghestan, and published several important works on the geology and mineralogy of those regions, among which may be mentioned: *Ueber die Natronseen auf der Araxesebene* (1846 and 1849); *Sur la structure et la géologie du Daghestan* (1862); and *Geologische Forschungen in den kaukasischten Ländern* (3 vols., 1878-87).

ABIES, ä'bī-ēz. See FIR.

AB'IGAIL or **ABIGAL** (Heb. 'father is joy,' or 'father has rejoiced'). The wife of King David, famed for her beauty and discretion. Abigail was originally the wife of Nabal, and gave food to David during his flight from Saul, after her husband had refused to do so. "About ten days later" Nabal died, and David took Abigail to wife (1 Sam. xxv. 2-42). The Amalekites captured Abigail during a raid on Ziklag (1 Sam. xxx. 5), but David recovered her (1 Sam. xxx. 18), and she bore him a son, Chileab (2 Sam. iii. 3), or Daniel (1 Chron. iii. 1). Another Abigail was daughter of Nahash, sister of Zemiah, Joab's mother, wife of Ithro, the Ishmaelite, mother of Amasa (2 Sam. xvii. 25, the less probable statement in 1 Chron. ii. 16 makes her a sister of David). In modern usage, derived from 1 Sam. xxv. 25, Abigail is employed as a general name for a waiting-maid or a lady's-maid.

ABI'JAH (Heb. 'Yahweh is father'), or **ABI'JAM**. The name of several persons mentioned in the Bible. The most important are: 1. Abijah, King of Judah, a son of Rehoboam and Maacah, the daughter of Abishalom (1 Kings xv. 2). He succeeded his father and reigned about three years (c.937-934 B.C.), during which time there was war between him and Jeroboam I (1 Kings xv. 7). Abijah probably gained a victory over Jeroboam near Zemaraim (2 Chron. xiii), but the number of combatants, 1,200,000, is greatly exaggerated. 2. A son of Jeroboam I, King of Israel (c.935-932 B.C.), who died in his childhood (1 Kings xiv. 1-18). The Vatican MS. and Lucianic recension of the Greek version bring in the story of his illness and his mother's visit to the prophet Abijah immediately after the death of Solomon, consequently before Jeroboam ascended the throne.

ABILA, äb'ila. An ancient city in Syria, capital of the tetrarchy of Abilene (q.v.), generally called Abila of Lysanias (q.v.). The modern site is Sūk Wādy Baradā, 20 miles N.W. of Damascus. Mediæval Arab geographers called this place Abil al Suk. There are still ruins of a temple, aqueducts, and tombs on the banks of the Baradā where the city once stood; and there is a Roman mile-stone with the inscription *mil. pass. II* exactly two miles from Suk.

ABILDGAARD, ä-bil'gār, NIKOLAI ABRAHAM (1743-1809). A Danish historical painter. He was born at Copenhagen, studied at the Academy there and in Rome and Naples. In 1778 he was appointed professor of the Academy at Copenhagen and, in 1789, its director. His most important work, a series of ten pictures in the castle of Christiansborg, was burned with the castle in 1794. The best paintings of his latest period were four scenes from Terence's *Andria* and others after Apuleius' *Golden Ass*, all in the Gallery of Copenhagen. Abildgaard

was the chief representative of the classic painting in Denmark and exercised a wide influence through his pupils, like Thorwaldsen.

ABILE'NE. A district referred to in Luke iii. 1, as well as in Josephus (*Ant.* xix, 5, 1; xx, 7, 1) as the tetrarchy of Lysanias. It was a fragment of the earlier kingdom of Iturea, the capital of which was Chalcis in the plain of Massyas, between the Lebanon and Anti-Lebanon Mountains. When the Romans took possession of this region, the Iturean kingdom became broken up into four tetrarchies, of which Abilene was one. This took place, probably, between 36 and 23 B.C. The Lysanias referred to by Luke was the second of that name, the first Lysanias having been ruler of the still undivided territory. The district of Abilene was so named from its chief town, Abila, on the Abanah, or Barada, the stream on which Damascus is situated. Abila, which has been identified with the ruins at Sūk Wādy Baradā, was on the eastern slope of the Anti-Lebanon range, just where the Abanah breaks through the mountains. In 37 A.D., Caligula gave Abilene to Agrippa I, who died in 44. In 53 it was given by Claudius to Agrippa II, who ruled it until his death in 100, when it became a part of the Roman province of Syria. Consult Schürer, *History of the Jewish People*, i, ii. 325-344.

ABILENE, ab'ē-lēn. A city and the county-seat of Dickinson Co., Kan., 163 miles west of Kansas City, on the Union Pacific, the Chicago, Rock Island, and Pacific, and the Atchison, Topeka, and Santa Fe railroads, and on the Smoky Hill River (Map: Kansas, E 5). The surrounding region is agricultural—alfalfa, corn, and wheat being the principal crops. Abilene is primarily residential, having many fine homes, but the city is the commercial centre for the district, and grain milling and the manufacture of merry-go-rounds and dairy products are among the industries. The city owns its water works, and an excellent supply is obtained from the celebrated Sand Springs, four miles from Abilene. Settled about 1860, Abilene was incorporated in 1869, the charter of that date continuing in operation until the commission form of government was adopted in 1911. During the early days of the beef industry Abilene and Dodge City (q.v.) were the greatest shipping points for cattle in the United States, being at the end of the long trail up which came practically all the beef cattle raised in the southwest. Pop., 1900, 3507; 1910, 4118; 1913 (est.), 4547.

ABILENE. A city and the county-seat of Taylor Co., Texas, 160 miles west by south of Fort Worth, on the Texas and Pacific, Wichita Valley, and Abilene Southern railroads (Map: Texas, E 3). It has a State Epileptic Colony. The industrial establishments include flour, grist, and planing mills, cotton gins, a cotton oil mill, a cotton compress, etc., a sanitarium, a Federal Court House, and a Carnegie Library. The commission form of government has been adopted. Pop., 1900, 3411; 1910, 9204; 1913 (est.), 12,000.

ABIMELECH, ā-bīm'ē-lēk (Heb. 'my father is king,' or 'Melek is father'). The name of two kings mentioned in the Old Testament.

1. A son of Gideon (Judges viii. 31), reckoned as one of the judges (Judges x. 1). Upon the death of his father, who refused to take the title of king, Abimelech set out to claim the sovereignty. He is said to have slain 70 of his brothers and to have been declared king

(Judges ix. 1-6). One of his brothers, Jotham, who escaped Shem, taunts the Shechemites with a fable whose point is that the nobler trees do not wish to rule over others, only the bramble is self-confident. In this fable it is possible to see a feeling antagonistic to monarchy. Three years afterward the Shechemites under the leadership of Gaal made an unsuccessful attempt to throw off his rule (Judges ix. 22-41). After capturing Shechem and burning the temple of Baal-berith, Abimelech went against Thebez, and here, while besieging the place, he was struck on the head by a piece of millstone thrown from the wall by a woman. To avoid an ignominious death, he ordered his armor-bearer to run him through (Judges ix. 43-57). His reign is the first attempt to establish a monarchy in Israel.

2. A King of Gerar mentioned both in the biblical narrative about Abraham (Gen. xx. and xxi. 22-32), and about Isaac (Gen. xxvi. 7-11, 26-33). The story in both cases is substantially the same. Abimelech takes Sarah into his harem, after Abraham, for fear that he should be killed, had declared her to be his sister. In a dream the true relation between Abraham and Sarah is revealed to Abimelech, who forthwith returns Sarah to her husband and loads the latter with presents of cattle and servants. Similarly Isaac declares to the men of Gerar, among whom he has settled, that Rebekah is his sister. Abimelech, however, discovers the true relationship and reproaches Isaac for having almost been the cause of bringing a "great sin" upon Abimelech and the men of Gerar. In view of this similarity, it is generally supposed by modern critics that the two stories are but different versions of one and the same tale. By an error the name Abimelech has been introduced instead of Achish (1 Sam. xxi. 2) in the title of Ps. xxxiv. In 1 Chron. xviii. 16 the text erroneously reads Abimelech instead of Ahimelech (q.v.).

ABINGDON. A city in Knox Co., Ill., 50 miles west of Peoria, and 85 miles northeast of Quincy, on the Chicago, Burlington, and Quincy and the Minneapolis and St. Louis railroads (Map: Illinois, B 3). It is the seat of Hedding College, a Methodist Episcopal institution, opened in 1853. Abingdon has wagon works, an animal-trap factory, said to be the largest in the world, and manufactures shirts and overalls, cement, paving brick, and tile. It is an agricultural region and has a few coal mines. The city was first settled in 1828 and was incorporated in 1857. It is governed by the charter of 1859. The mayor's term is one year, and the city council is composed of five members. The city owns its water works. Pop., 1890, 1321; 1900, 2022; 1910, 2464; 1913 (est.), 3000.

ABINGDON. A town and the county-seat of Washington Co., Va., 189 miles west by south of Lynchburg, on the Norfolk and Western and Virginia-Carolina railroads and the Holston River (Map: Virginia, C 5). It is the seat of Martha Washington College (Methodist Episcopal, South), established in 1858, Stonewall Jackson Institute (Presbyterian), opened in 1869 (both for young ladies), and Abingdon Academy. It also has a U. S. court house and county court house. There are canning, brick, cigar, column, and wagon factories, and flour, lumber, and planing mills. Abingdon was settled about 1770 and was incorporated in 1778.

The town has furnished the State with three governors, Floyd, Robertson, and Campbell. Pop., 1910, 1757; 1913 (est.), 1760; with suburbs, 3000.

AB'INGTON. A manufacturing town in Plymouth Co., Mass., 20 miles southeast of Boston, on the New York, New Haven, and Hartford Railroad and Old Colony Electric (Map: Massachusetts, F 3). It was settled about 1680 and incorporated as a colonial town in 1712. The town's affairs are administered by town meetings. The leading industry of Abington is the manufacture of boots and shoes. The town owns and operates its water works. It has a fine park in which a memorial arch to Civil War veterans was dedicated in 1912. Pop., 1890, 4260; 1900, 4489; 1910, 5455; 1913 (est.), 5500. Consult B. Hobart, *History of the Town of Abington* (Boston, 1866).

ABINGTON, FRANCES (1737-1815). A famous English actress. She was the daughter of Barton, a common soldier. As an errand-girl, she acquired French from a milliner. She became a flower-girl at the theatres, and made her first appearance at the Haymarket in London (1775) as Miranda, in *The Busybody*. She was married to Abington, her music teacher, from whom she soon separated. The headdress she wore was adopted by the women of fashion, and the "Abington cap" became famous. Returning to England in 1765, at the invitation of Garrick, she played at Drury Lane for 18 years, and later at Covent Garden. She was the original representative of Lady Teazle in 1777, and played many Shakespearean parts. After the retirement of Mrs. Pritchard and Kitty Clive, she had no rivals on the London stage and became the first comic actress of the period. Her last appearance was on April 12, 1799.

AB'IOGEN'ESIS. See BIOGENESIS.

ABIPONE, ä'bê-põ'nâ. A South American Indian tribe of Guaycuruan stock, which formerly wandered over the Gran Chaco region, west of the Paraguay River, from the headwaters of the Rio Grande in Bolivia southward to the Vermejo in Argentina. Their traditions pointed to a more northern origin. They obtained horses about the year 1640 and soon developed into bold riders and implacable foes of the Spaniards. They were of splendid physique and lived entirely by hunting. The women tattooed, and the men practiced the couvade. Their weapons were the bow, the lance, and the shield. The Jesuits established missions among them, but, owing to constant wars with the Spaniards and with other tribes, and also to the custom among the women of killing all but two children born to a family, the tribe, which about 1780 was estimated at 5000, dwindled rapidly and is now extinct. See Dobrizhoffer, *An Account of the Abipones* (3 vols., London, 1822), Church, *Aborigines of South America*, pp. 262-268 (London, 1912), and Kersten in *Intern. Arch. f. Ethnogr.*, vol. xvii, pp. 1-75 (1904).

ABITIBI, äb'î-tîb'î. A Canadian river and lake. The river flows northward to James Bay in Hudson Bay, and is the outlet of the lake which is situated in lat. 48° 24' N. at an elevation of 830 feet, with a Hudson Bay Co. trading station of the same name upon its shores.

ABJURATION (Lat. *ab-jurare*, to deny upon oath, to forswear). The act of dissolving by an oath the allegiance due to a temporal or spir-

itual ruler. It is in this sense that the term is employed in the Oath of Abjuration by which in England all subjects bound themselves not to acknowledge any right in the Pretender to the crown. To abjure the realm is to renounce one's citizenship and go into voluntary exile. Formerly in England any felon who had taken sanctuary (q.v.), except those guilty of treason or sacrilege, might claim immunity by abjuring the realm. This privilege was abolished by Act of Parliament in the first year of James I (1603). In the United States an alien applying for citizenship is required under oath "to renounce and abjure all allegiance and fidelity which he owes to any foreign prince." See OATH.

ABKHASIA, äb-kä'sê-ä, or **ABASIA.** A district of European Russia in the government of Kutais, Trans-Caucasia. It comprises the southern slope of the Caucasus Mountains extending to the Black Sea, in lat. 44° 15' N. It derives its name from the Abkhasians. Its mountainous surface is covered with rich woods of oak, walnut, etc. Area coincident with that of the military district of Sukhum, 2545 square miles; pop. (1911), 136,500. Its population, mainly Mingrelians and Abkhasians, is engaged in agriculture, cattle-raising, and trade in lumber. The soil is fertile, and grain and fruit are grown. After the Emperor Justinian introduced the Christian religion, Persia, Georgia, and Turkey ruled in succession, the latter suppressing Christianity and establishing Moslemism. The Russians began to establish themselves after the Treaty of Adrianople in 1829, but the conquest was not completed till 1864. The chief town in this region is Sukhum Kale. The people speak a Circassian dialect, and are physically akin to that stock, although typically ruder and less graceful. Their folk-life is also more primitive. As a result of the Russian occupation, 20,000 natives emigrated into Turkish territory. See CIRCASSIANS.

AB'LATIVE CASE. A form of grammatical inflection, found in many Indo-European languages, expressing ablative relations which are usually denoted in English by means of the prepositions *in, with, by, from,* etc.

ABLAUT, äb'lout; *Ger. pron. äp'lout.* or VOWEL GRADATION. The name given by German scholars, and in common use in English, to a change in the root vowel in different forms of the same word. It appears throughout the Indo-Germanic languages, and is frequent in nouns, although it is most obvious in the so-called "strong verbs" of the Germanic group (e.g., *sing, sang, sung*). It is divided into quantitative (varying between vowels of different length) and qualitative (as between *e* and *o*). Both forms depend originally on accent, as Sanskrit *sétu*, 'binding,' but *sitá*, 'bound,' or Greek *πατήρ*, 'father,' but *εὐπάτωρ*, 'of noble descent.' The full application of ablaut has conclusively shown the existence of dissyllabic and even trisyllabic roots in Indo-Germanic. Consult: Hirt, *Der indo-germanische Ablaut* (Strassburg, 1900); Wood, *Indo-European a; ai; au* (ib., 1905). See PHONETIC LAWS.

AB'LEGATE (Lat. *ab, away, from, off + legare, to send with a commission*). A papal envoy or emissary, a special commissioner, deputed by the papal court at Rome to carry the hat and red biretta to a newly appointed cardinal. His official duties are completed when the latter has received the insignia of his office. The

so-called *apostolic* ablegates are of higher rank than those termed *pontifical*.

ABLU'TION. See PURIFICATION.

ABNAKI, ăb-nă'kê ('Easterners'). A confederacy of Algonquian tribes, including the Passamaquoddies, Penobscots, Norridgewocks, and others, formerly occupying what is now Maine and southern New Brunswick. On the northeast their territory adjoined that of the Micmacs, while on the southwest it merged into that of the Pennacooks. In consequence of King Philip's War (see WAMPANOAG), they attached themselves to the French side and maintained unceasing hostility against the encroachment of the English, until the destruction of their principal town at Norridgewock and the killing of their missionary Rasle in 1724, after which the greater portion removed to Saint Francis, Canada, whither other refugees from the New England tribes had already preceded them. Those who remained afterward entered into an arrangement with the English by which they were confirmed in possession of a small part of their ancient inheritance. They are now represented by the Malecites on Saint John River, New Brunswick, and Quebec, the Passamaquoddies on the bay of that name in Maine, the Penobscots at Oldtown, Maine, and the Abnakis at Saint Francis and Bécancour, Quebec. Their language is preserved in the monumental dictionary of Rasle.

ABNER (Heb. 'Father of light'). The son of Ner, and cousin of Saul, and commander of his army (1 Sam. xiv. 50). After Saul's death the tribe of Judah recognized David, while Abner prevailed upon the other tribes to recognize Saul's son, Ishbaal (2 Sam. ii. 8-11). (See ISHBOSHETH.) David sent his army, under Joab, into the field, and at the pool of Gibeon they met. Abner resorted to a ruse to terrify Joab's men. He proposed an athletic contest for amusement between twelve of his men and twelve of Joab's. The former were Benjaminites and probably, like Ehud, left-handed so that they could conceal a short sword on their right side. The result was that by a trick the Judæans were all slain. The indignant army of Joab then fell upon Abner's host and inflicted upon it a crushing defeat (*ib.*, verses 12-16). In his flight Abner, being hotly pursued by Asahel, turned and reluctantly slew him (*ib.*, verses 19-23). Afterward Abner had a quarrel with Ishbaal and went over to David (2 Sam. iii. 7-11, 17-21); but the death of Asahel produced a blood feud between Joab (Asahel's brother) and Abner, which ultimately led to Abner's death. In consequence of a quarrel between Abner and his master, Ishbaal, who accused him of having designs upon the throne, Abner espoused David's cause. While being hospitably entertained by David at Hebron, Abner was treacherously killed by Joab with the connivance of his brother Abishai (2 Sam. iii. 22-27). The murder called forth general indignation, and the King himself acted as chief mourner. He ordered a public mourning, and an elegy is preserved (2 Sam. iii. 33-34), composed by David in memory of Abner, which reads:

"Has Abner died as Nabal died?
Thy hands are not in fetters bound,
Thy feet are not in brazen chains;
Through sons of violence thou hast fallen!"

The plural, vouched for by the Greek version, was purposely used. David probably knew that

Joab had murdered his guest, but it was not politic to point to his great general as the assassin. See Batten in *Zeitschrift für die alttestamentliche Wissenschaft* (1906, pp. 90 ff.) and N. Schmidt, *The Messages of the Poets* (1911, pp. 367 ff.).

AB'NEY, Sir WILLIAM DE WIVELESLE (1844—). An English astronomer and physicist. He was born at Derby, educated at the Royal Military Academy, Woolwich, became a lieutenant in the Royal Engineers in 1861 and a captain in 1871. He was president of the Royal Astronomical Society, 1893-95, and president of the Physical Society of London, 1895-97. He became adviser to the Science and Art Department of the Board of Education in 1903, having been principal assistant secretary since 1899. In the same year he became a member of the Advisory Council for Education to the War Office. He is well known for his researches in photography and spectroscopy, and has published a number of important books on these subjects, including *Instruction in Photography* (1870); *Treatise on Photography* (1875); *Colour Vision, Colour Measurement and Mixture* (1893); *The Pioneers of the Alps*, with C. D. Cunningham (1888). He was knighted in 1900.

ABNORMAL PSYCHOLOGY. See MENTAL PATHOLOGY; PSYCHOLOGY.

ÅBO, ă'boo or ă'boo. The most ancient city and former capital of Finland, now the chief town of the Russian government of Åbo-Björneborg, situated on the river Aurayoki, near its embouchure in the Gulf of Bothnia, 128 miles west by north from Helsingfors, and nearly 400 miles by rail from St. Petersburg (Map: Russia, B 2). Its streets are broad and lined with rather low stone buildings. Owing to its antiquity, Åbo has a number of buildings of historical interest, among them the cathedral, which is dedicated to St. Henry, the patron saint of Finland. It contains a magnificent sarcophagus erected in 1865 for the unfortunate Queen, Catharine Monsdotter, who died in 1512. In one of the suburbs is the spring of St. Henry, in which, according to tradition, the first Finns embracing Christianity were baptized. It is in regular steamship communication with St. Petersburg, Copenhagen, Stockholm, and other ports on the Baltic. As its harbor does not admit vessels of more than 10 feet draught, large ships dock at Bornholm, which is visited annually by some 700 vessels, whose aggregate tonnage reaches about 200,000 tons. Shipbuilding is an important industry, many Russian warships having been constructed in this city. The great Crayton works supply the Russian fleet with torpedo boats. It has a number of cotton mills, tobacco factories, sugar refineries, and machine shops, and exports lumber and dairy products. Of its educational institutions, the School of Navigation and the School for Deaf Mutes deserve special attention. In addition to these it has a number of gymnasiums, a technical institute, a commercial school, and a normal training school. The United States is represented by a consular agent. Pop., 1897, 34,964; 1910, 49,691. The inhabitants are largely Finns and Swedes, the former predominating. The town grew up around a castle (which is still in existence and is used as a prison at present) founded in 1156 by Eric IX, and became an important place in the following century. It was repeatedly attacked and destroyed by the Rus-

sians in their many wars with the Swedes and finally fell into their hands in 1808; since then it has remained a Russian possession. It was the capital of Finland until 1819. In the year 1827 a great part of the town, including the university buildings, was destroyed by fire, and the university was removed to Helsingfors, now the capital. The Peace of Åbo (1743), between Sweden and Russia, gave Russia control of the southern part of Finland as far as the Kymen River and put an end to the war commenced by Sweden, under French instigation, in 1741.

ÅBO-BJÖRNEBORG, ö'boo- or a'boo-byēr'-ne-börg. A government in southwest Finland. Area, 9333 square miles. Its topography is like that of the rest of Finland. Interspersed among the granitic ridges are many lakes and marshes. The southern section is more hilly than the northern, and along the seashore has many safe havens for sea-going vessels. Except the Kumo, Åbo-Björneborg has no navigable rivers. It has a temperate and healthful climate, and the principal industries are agriculture, cattle-raising, and fishing. There is a flourishing mining industry, the chief products being granite, black marble, iron, and clay. Åbo-Björneborg is, moreover, the foremost manufacturing province of Finland, the chief branches of industry being wood and metal working, distilling, brewing, and the manufacture of sugar, leather, paper, and tobacco. Pop., 1897, 425,026; 1904, 470,077; 1910, 499,332. About one-fifth are Swedes.

AB'OLI'TIONISTS (Lat. *abolitio*, an annulling, from *abolere*, to check the growth). The term used in the United States, after 1835 and until the Civil War, for those opponents of slavery who were the most intense in their desire to secure the immediate emancipation of the blacks. Others avowed their "anti-slavery" opinions, but these advocated, by all the means they could command, immediate "abolition." Their position was weakened, and their reputation for sobriety was damaged, by their steadfast refusal to recognize the binding force of any human laws which recognized human slavery, and even of the constitution; and their extreme demands and radical methods repelled the sympathy of many conservative men who desired that the abolition of slavery should be secured by expedient and legal means. Although discredited in many quarters, the abolitionists were in the end successful, from one point of view, in making slavery a national issue and in hastening the time of final decision as to its continuance. Among the most conspicuous leaders of the abolitionists were William Lloyd Garrison, a vigorous and fearless writer, Wendell Phillips, Gerrit Smith, a generous philanthropist, Theodore Parker, Arthur Tappan, William Goodell, and Lucretia Mott. The lives of most of these leaders have been written. Consult Garrison, *William Lloyd Garrison* (New York, 1885-89) and Hume, *The Abolitionists* (New York, 1905); Herbert, *Abolition Crusade and Its Consequences* (New York, 1912). See ANTI-SLAVERY SOCIETY; GARRISON, WILLIAM LLOYD; GIDDINGS, JOSHUA R.; and PARKER, THEODORE.

ABOLITION OF SLAVERY. See SLAVERY.

ABO'MA (Portug.). A boa. The term is widespread in tropical America, but lately has been more especially applied to the Central American thick-headed rainbow or singed boa

(*Epicrates oenchrus*), which is of great size and is dark yellowish-gray, having a row of dark brown rings along the back, and the sides marked with dark blotches, each inclosing a lighter crescent. In the sunlight the pattern disappears under a blaze of peacock green, merging into red and violet, the scales fairly glowing with iridescence. See BOA and Plate of BOAS.

ABOMEY, ä'bō-mā'. A former capital of the kingdom of Dahomey, West Africa, situated about 60 miles inland, in 7° N. lat. and 2° 4' E. long. It is situated in a plateau and is surrounded by a wall built of mud and thorns, and a deep trench. The houses, also built of mud, are unpretentious in appearance. There are several royal palaces, once the scenes of religious rites and barbaric orgies. Before the French occupation Abomey was an important slave market, but at present the traffic is confined to ivory, palm oil, and gold. The town was captured by the French in 1892. Pop., 10,732.

ABORIGINES, äb'ō-rīj'ī-nēz. Properly, the earliest inhabitants of a country. The Roman and Greek historians, however, apply the name to a mythical people, brought by story in connection with Latinus, Evander and Æneas (q.v.). According to tradition, they had their original seats in the mountains about Reate, now Rieti; later they descended into Latium, and subdued or expelled the Siculi (according to another story, they combined with the Siculi) and occupied the country. The Aborigines then disappeared as a distinct people, they and their subjects (or allies) having taken the name of the Latini. The Romans derived the name from *ab*, from + *origo*, origin, and so used the name *aborigines* as exactly equivalent to the Greek *Autochthones* (q.v.). This etymology, however, modern scholars will not accept; it has been recently suggested that *Aborigines* is a mutilated form of the true name of this early people.

ABOR'TION (Lat. *abortio*, from *ab*, away + *oriri*, to rise). The expulsion of the offspring from the womb of its mother before it is capable of living independently. Abortion occurring in a woman before the sixth month of pregnancy is generally called a miscarriage. If the fœtus leaves the womb after it is viable and before the proper end of pregnancy, the occurrence is termed a premature delivery. Hegar considers that there is, in women, one abortion to every 10 normal pregnancies; Devilliers states the ratio as one in three or four. Whitehead states that 80 per cent of all abortions take place between the second and fourth months of pregnancy. It is therefore important that a mother should have special care during the early months of gestation. Microscopical examination is required to determine the fact of an abortion occurring within four weeks of conception. After the first month the fœtus commences to assume a recognizable shape.

Causes of Abortion. Abortion may be due to disease of the father, to morbid changes in the ovum, to morbid changes in the placenta, or to maternal causes. 1. Of the diseases of the father that may cause abortion, syphilis is the most important. Habitual abortion leads to the suspicion of syphilitic taint, although other causes may bring about this condition. Old age, tuberculosis, or kidney disease of the father may so affect the vitality of the germ at

conception that, although pregnancy may occur, there is not enough strength to complete the development. 2. Causes due to disease or death of the ovum itself, apart from other causes, are rare. They are usually associated with some defect in the formation of the young embryo. 3. Placental causes are frequent. If the placenta does not have a sufficient area from which to draw a blood supply for the fœtus, the latter may die; or if the placenta is fastened low in the uterus, hemorrhage and abortion are very liable to occur. 4. The causes which are due to disease or injury of the mother are the most frequent. Diseases of the decidua of the uterus and of the other generative organs, such as tumor of the ovary, distention of the Fallopian tubes, inflammatory adhesions about the uterus, and badly formed pelvic organs, are among the local causes. Certain constitutional diseases may also cause abortion, as syphilis. Alcoholic excesses are almost as pernicious. Poisoning with metals, as lead or mercury, with phosphorus and other poisons, as coal gas and many volatile oils, and some of the acute diseases, pneumonia, yellow fever, smallpox, and peritonitis, have brought about abortion. Shock and injury are very important causes. Excessive muscular fatigue, bicycle riding, horseback riding, lawn tennis, use of the sewing-machine, and swimming are especially to be avoided. Lack of hygiene is also responsible for numerous cases. Insufficient food, contaminated air, change in climate, and tightly laced corsets, all interfere with the proper nourishment of the fœtus and thus induce abortion. After abortion has once taken place, others are very likely to occur, even in comparatively healthy women. A normal healthy mental attitude is a saving grace from this accident.

Symptoms. The cardinal symptoms are pain and hemorrhage from the uterus, these varying greatly, according to the completeness of the process. Early symptoms may be a sensation of weight, with distress or slight pain in the back, increased by standing or walking, followed by oozing or a menstrual flow, or a sudden large hemorrhage. This may occur intermittently, sometimes lasting several days, with small discharges of blood, with pain, and then a cessation of all the symptoms for a few hours or more. In later abortions, the *liquor amnii*, in which the fœtus is suspended, may either ooze away or come away in a gush.

The pain is rarely continuous; at times it resembles the intermittent pains of a colicky diarrhœa. It is caused by the contraction of the uterine muscle trying to eject a foreign body. With each muscular contraction there is oozing, or more copious bleeding, or the expulsion of the product of conception. If the pains are comparatively weak and occur at long intervals, it may be possible to prevent the abortion. If they are strong and come closely one after the other, the chances of stopping the process are less.

Treatment. Healthy physical and mental exercise is one of the best preventives of this accident. In families where the mother or grandmother aborted frequently, special care of diet, exercise, and clothing should be taken. Constipation should be avoided by the use of water and the green vegetables. Should the symptoms mentioned occur, the woman should lie down, absolutely quiet, on her back and call her regular medical attendant.

There are occasional cases (as where the outlet of the pelvis is very contracted) in which it is necessary for physicians to induce abortion. It cannot be too generally known that all attempts at procuring criminal abortion, either by the administration of powerful drugs or the application of instruments, are accompanied with extreme danger to the pregnant woman. It cannot be too earnestly impressed upon the mind of those who are tempted to procure a criminal abortion by means of drugs that the danger of causing death is very serious. Many so-called emmenagogues (q.v.), which induce the menstrual flow in a woman who is not pregnant, but is merely suffering from amenorrhœa, or suppression of the menses, are abortifacients only when given in such doses as to endanger life, or to set up violent internal inflammations. Among these are the various preparations of ergot of rye (q.v.), savin (the most powerful of all emmenagogues), borax, rue, tansy, cantharides, etc. In the South, among the ignorant negroes, concoctions of pennyroyal and cotton-root bark are used for the same purpose. The milder emmenagogues, such as iron, aloes, etc., have no abortive tendency, except in the case of those women who are predisposed to abort. Violent purgatives, in cases where they have caused abortion, have not done so because they directly exercise an ecboic effect on the uterus, but only as a secondary consequence of the excessive intestinal irritation which they cause.

Abortion, in Law. The criminal act of causing the premature bringing forth of the human fœtus. Under modern statutes the crime may be committed at any stage of the development of the fœtus, but it would seem that by the common law of England the act of relieving the pregnant woman of the fœtus before it had given any signs of life was not a criminal offense if done with her consent; if committed without her consent, it was punishable only as an assault. In this country divergent views have been held by the courts. In a number of States there are decisions or dicta to the effect that "to produce an abortion on a woman, before she is quick with child, and with her consent," is not to commit the common-law crime of abortion. On the other hand, it has been judicially declared in Pennsylvania that "it is not the murder of a living child which constitutes the offense of abortion, but the destruction of gestation by wicked means and against nature," and, consequently, that one who intentionally causes the miscarriage of a woman, even with her consent and before the fœtus has quickened, is indictable at common law. At present the crime is generally defined, with much particularity, by statute, and may be committed by one of three classes of persons. First, by the pregnant woman who takes any drugs or submits to any treatment with intent to produce her miscarriage, unless that is necessary to save her life or the life of the child. Second, by a person prescribing, supplying or administering any substance to a woman, or treating her, with intent to cause her miscarriage, unless that is necessary to save her life or the life of the child. Under some statutes, such a person may be guilty of the offense, whether the woman is pregnant or not, or whether the fœtus is alive or not, or even whether the attempt to procure miscarriage succeeds or not; the gist of the crime consisting in the intention with which the act was done. Third, by a person manufacturing, giving, or selling an instrument or substance with intent that

it may be unlawfully used in procuring the miscarriage of a woman. Acts done in procuring an abortion may subject the wrongdoer to punishment for another crime also, as assault (q.v.), or homicide (q.v.). Consult: Wharton, *Criminal Law* (San Francisco, 1912); Clark and Marshall, *Treatise on the Law of Crimes* (St. Paul, 1905).

Abortion in Animals. See CONTAGIOUS ABORTION.

Abortion in Plants. That kind of arrest in development by which an organ appears in its early stages, but fails to develop to its normal form or size. For example, in many flowers certain stamens are aborted, their primordia having appeared, but having failed to develop into functioning stamens. The abortion may be of any degree between the first appearance of the organ and its complete maturity. A very closely related term is "suppression," in which not even the beginning of an expected organ appears. The phenomenon is chiefly observable in connection with the flower (q.v.).

ABORTION, CONTAGIOUS. See CONTAGIOUS ABORTION.

ABOU BEN ADHEM (ä'bōō bēn äd'hēm) **AND THE ANGEL.** A short narrative poem by Leigh Hunt, the significance of which appears in the line,

"Write me as one that loves his fellow men."

ABOUKIR, ä'bōō-kēr'. See ABUKIR.

ABOULIA, ä-bōō'li-ä. See under INSANITY.

ABOUT'. See TACKING.

ABOUT, ä'bōō', EDMOND FRANÇOIS (1828-85). A brilliant, witty, but uneven French journalist, novelist, and writer of social and political essays. He was born at Dieuze, completed his studies in Paris with Francisque Sarcey, won honors, and was sent in 1851 to the French School at Athens, where he studied little, but observed much in a desultory way. The literary result of his two years' stay in Greece is *La Grèce contemporaine* (1854), and *Le roi des montagnes* (1856), both full of humor and irony. They were popular, often translated, and had influence on what passed for political thought. In 1855 he published *Tolla*, a story of Italy, borrowed in part, and without due acknowledgment, from an Italian novel, *Vittoria Savorelli* (1841). In 1856 he essayed the stage without success, but won popularity by short stories collected under the titles *Les mariages de Paris* (1856) and *Les mariages de province* (1868). His most popular stories are *Trente et quarante* (1858), *L'homme à l'oreille cassée* (1861), and *Le nez du notaire* (1861), often translated. More serious novels are *Madelon* (1863), *L'infâme* (1867), and *Le Roman d'un brave homme* (1880). He had a gift of facile narration, but he did not take his talent seriously and ceased writing fiction with the fall of the Second Empire, of which he was a spoiled child. To politics during these years he had contributed *La question romaine* (1859), *Rome contemporaine* (1861), *La Prusse en 1860*, *La nouvelle carte de l'Europe* (1860), and *Le progrès* (1864). After the fall of the Empire he became editor of *Le XIX Siècle*, and published a bitter book on Alsace (1872). He was made an academician in 1884, but died before his admission. The general characteristics of his work are a kindly humor, a keen irony, a cleanly taste, and a rather shallow skepticism. Consult Wells, *A Century of French Fiction*, s.v. About.

ABOVILLE, ä'bō'vê'y' or ä'bō'vêl', FRANÇOIS MARIE (1730-1817). A French general

of artillery and peer of France. He was born at Brest. During the war of the American Revolution he commanded Rochambeau's artillery at Yorktown (1781). In 1792 he commanded the armies of the North and of Ardennes, and in 1809 was appointed Governor of Brest.

ABOX'. See BOX HAULING.

A'BRA. 1. A character in Prior's poem "Solomon on the Vanity of the World." She appears in the second part of the poem as an obedient concubine of the King and finally captivates him. 2. A character in the mediæval romance of "Amadis of Greece." She is a sister of the Sultan of Babylon and secures his throne after he is killed by her lover, Lisnarte.

ABRABANEL, ä-brä'bä-nël', **ABARBANEL**, ä-bär'bä-nël', or **ABRAVANEL**, ä-brä'vá-nël', ISAAC BEN JEHUDA (1437-1508). A Jewish scholar and statesman. He was born in Lisbon and claimed descent from King David. He was treasurer of Alfonso V, but after that King's death was banished from Portugal and his property confiscated. In Spain he made a fortune as a merchant, and was in high favor with Ferdinand and Isabella in 1487; but the decree of 1492 banished all Jews from Spain, and Abrabanel fled to Naples, where he found royal favor, but was again obliged to fly when Naples surrendered to the French in 1495. He settled last at Venice. He was one of the ablest men of his time and was learned in biblical exegesis and philosophy. He presented the Jewish doctrine of the Messiah in *Sources of Salvation* (1496), *Salvation of his Anointed* (1497), and *Proclaiming Salvation* (1498).

AB'RACADAB'RA. A magical term, according to some authorities derived from Abraxas (q.v.), but more probably mere jargon. It was supposed efficacious against various ailments. The earliest mention of the term is in a poem "Precepta de Medicina," by Q. Serenus Sammonicus, a Gnostic physician of the second century, who considered it efficacious against fevers and agues. The word had to be written in a manner similar to the diagram, then folded in the form of a cross, worn as an amulet for nine days, and finally thrown backward before sunrise into a stream flowing eastward. The use of this formula spread throughout the Empire and was handed down through the Middle Ages. A comparatively modern manuscript in the British Museum relates that a Mr. Banester, by the use of abracadabra, cured over two hundred cases of ague in a year. The term is also applied to any word charm or magical jingle. See ABRAXAS; AMULET; TALISMAN.

ABRADA'TAS. A King of Susa, who at first fought against Cyrus the Great, but who afterward, in consequence of the latter's kindness to Panthea, his wife, when she had been captured by the Persians, yielded to Cyrus and became his ally. Abradatas perished in the war against Cræsus the Lydian. The story of his romantic affection for Panthea and her suicide after his death is told in the fifth book of Xenophon's *Cyropædia*.

A'BRAHAM. The patriarch whose story is given in Gen. xi-xxv. It consists of a series of incidents in his life, put together in a consecu-

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tive narrative and emanating from different literary sources. In Gen. xi. 10 the genealogy of the Semites (or sons of Shem) is given, leading up to Terah, the father of Abram, Nahor, and Haran. The home of Terah and his sons is Ur of the Chaldees—a place commonly identified with the site of the mound Mukayyar, in southern Babylonia—but after the death of Haran the Terahites journey northward to Haran and take up their settlements at that place. Terah dies in Haran, and Abram, accompanied by his wife Sarai and his nephew Lot (the son of Haran), quits Babylonia by divine command and proceeds by a circuitous northern route via Damascus to Canaan. He halts at various places, notably Shechem and Bethel, where he erects altars to Yahweh (chap. xii). Leading a pastoral life, we next find him in Egypt, whither he has been driven in consequence of a famine in Palestine. Sarai's beauty attracts the attention of Pharaoh, and but for Yahwe's intervention Abram would have been obliged to give up his wife, whom he had represented to be his sister. Pharaoh obliges Abram to leave Egypt, and he accordingly returns to Bethel with Lot. At this juncture the separation between Abram and Lot takes place in consequence of quarrels between the followers of the two chiefs. Lot chooses for himself the rich pasture-land of the Jordan valley, while Abram remains in Canaan proper, though removing to Hebron. He pursues Chedorlaomer (q.v.) and the kings who were with him in the raid they had made on Palestine as far as Dan, near the sources of the Jordan, and rescues Lot, who had been taken captive. He not only succeeds in this enterprise, but aids in restoring the kings of Sodom and Gomorrah to power, and magnanimously refuses any compensation for his services (chap. xiv). At the time that Abram left Haran he was 75 years old. At Damascus he had been joined by Eliezer, who became his trusted servant, and on whom the succession to Abram's property would fall in the event of Abram remaining childless. This contingency is eliminated by the birth of Ishmael, a son by Hagar, a concubine of Abram, and an Egyptian maid-servant of Sarai. Subsequently, however, when Abram is 99 years old and Sarai 90, a son, who is called Isaac, is born to them (chap. xvii). He becomes the heir of Abram in preference to Ishmael. At the time that this son is promised to Abram and Sarai, through the appearance of Yahwe himself to Abram, the names of the patriarch and his wife are changed by the Lord to Abraham and Sarah, respectively, the former being interpreted as embodying the promise that the patriarch shall become "the father of a multitude of nations." The promise of a son to be born to Sarah is confirmed by a visit of Yahwe accompanied by two angels, all three in human form, who partake of Abraham's hospitality and make a similar announcement. The two angels proceed to Sodom and Gomorrah, while Yahwe remains behind and reveals to Abraham the intended destruction of the cities of the plain because of the wickedness and corruption prevailing there. Abraham pleads with Yahwe to save the cities for the sake of the righteous, and Yahwe agrees to do so provided only ten righteous men are found in the district. As a matter of fact, the cities are destroyed, and only Lot and his family are permitted to escape (chap. xvii), though his wife is turned into a pillar of salt because of her disobedience.

Before Isaac is actually born, Abraham is represented as proceeding to the extreme south of Palestine, known as the *Negeb*, and at Gerar encounters Abimelech. This King takes into his harem Sarah, whom Abraham again passes off as his sister. But Yahwe warns Abimelech, and Sarah is released (chap. xx). The birth of the promised son, who is called Isaac, is then related (chap. xxi). Eight days after his birth he is circumcised—an act which is regarded as symbolizing the covenant established between Yahwe and those descended from Abraham (Gen. xvii. 23–27). Some years later the faith of Abraham is put to a severe trial by the divine command to sacrifice his beloved son (chap. xxii). Abraham proceeds to carry out the decree, but is withheld from doing so by Yahwe himself, who, satisfied with the test, accepts a ram which providentially makes its appearance. The last three chapters of the narrative are taken up with the account of Sarah's death, her burial in the cave of Machpelah at Hebron, purchased by Abraham from Ephron the Hittite, the marriage of Isaac and Rebekah, and the death of Abraham, which, however, does not take place until his marriage to Keturah, by whom two sons are born to him. The death of Abraham takes place when he has reached the age of 175 years, and he is interred by the side of Sarah at Machpelah.

Many modern Bible critics regard this cycle of Abrahamic stories as embodying a mixture of early and late traditions, a recast with a view of presenting Abraham as a type of the pious worshiper of Yahwe. Besides the biblical stories, other tales were current, or became current among the Jews of post-exile days, many of which were taken up into that portion of rabbinical literature known as the *Midrash*. In this way the biblical narrative was supplemented by incidents in the early career of Abraham, on which Genesis has nothing to say. These stories bring Abraham into association with Nimrod. The historical kernel in the Genesis chapters is regarded by these critics as quite insignificant. The genealogical lists seem to them fictitious, the names representing in most cases not individuals but clans, of whom some faint traditions have survived. The name of Abram, however, or Abraham (a dialectical variation), is not that of an eponymous hero, there being no reference to any "Abramites." It is therefore considered to be either the name of a god (*ab ram*, 'exalted Father'), or of the mythical ancestor of a number of tribes, or of an historical personage concerning whom little else can be affirmed with certainty. The home of this figure seems to be in Hebron. If, as many scholars think, Gen. xiv is in part at least drawn from an old cuneiform source, the episode with which Abram's name is connected would fall in the reign of Hammurapi, c.2124–2081 B.C. (see *AMRAPHEL*). The wanderings of the Terahites, among whom Abram is reckoned, reflect the faint recollection of the origin of the Hebrews, or of some of the clans who subsequently formed part of the coalition known as Hebrews. The story of the wanderings of the Terahites along the Euphrates and thence into Palestine is typical of the manner in which nomadic bands in the early and the late days of Babylonian history proceeded from the Arabian desert and, attracted by Babylonian culture, skirted the western borders of the country; some making more or less permanent

settlements, while others passed on to the north. A significant passage in Deuteronomy (xxvi. 5) designates the ancestors of the Hebrews as "Nomadic Aramæans." Aram here is a designation for Mesopotamia, and the chief value of the story of Abraham's wanderings lies accordingly in thus preserving a picture of conditions prevailing at the earliest period of which any recollection survived among the people.

Bibliography. For the rabbinical legends and traditions about Abraham, consult: Beer, "Das Leben Abrahams" in *Lebensgemälden biblischer Personen nach Auffassung der jüdischen Sage* (Leipzig, 1859); Grünbaum, *Neue Beiträge zur semitischen Sagenkunde* (Leipzig, 1893), which also contains the Mohammedan legends about Abraham. For archæological aspects, see Tomkins's *Studies on the Times of Abraham* (London, 1878); Procksch, *Das nord-hebräische Sagenbuch* (1906); Wilke, *War Abraham eine historische Persönlichkeit* (1907); Dhorme, in *Revue Biblique* (1908); Winckler, *Abraham als Babylonier, Joseph als Aegypter* (1903); Nöldeke, in *Im neuen Reich* (1871, 508 pp.); Ed. Meyer, *Die Israeliten und ihre Nachbarstämme* (1906); Gunkel, art. "Abraham," in *Die Religion in Geschichte und Gegenwart* (1909), as well as the histories of the Hebrews by Stade, Kittel, Guthe, Piepenbring; and the commentaries on Genesis by Gunkel, Dillmann, Delitzsch, Strack, Holzinger, Skinner, and Driver.

ABRAHAM, PHINEAS S. A celebrated English pathologist and dermatologist. He was born in Falmouth, Jamaica, and received his education at University College, London, and the Royal College of Science and Trinity College, Dublin. At all these institutions he received high honors. With the degrees of chemical and mining engineer, on the conclusion of his collegiate education, he entered St. Bartholomew's Hospital, London, in 1876. He also studied medicine at the Ecole de Medicine, Paris, and at Clausthal, Germany. In 1879 he was appointed curator of the museums of the Royal College of Surgeons in Dublin and was subsequently elected a member of the Court of Examiners. He was lecturer on physiology and histology at the Westminster Hospital Medical School in 1885 and in 1889 became medical secretary of the National Leprosy Fund. In 1897 he represented the United Kingdom at the International Leper Conference at Berlin. He was one of the founders of the Royal Academy of Medicine of Ireland and of the Dermatological Society of Great Britain and Ireland. Among other important official positions he was chosen to be surgeon-in-charge of the skin department at the West London Hospital, lecturer on dermatology at the West London Post-Graduate College, and, in 1910-11, president of the West London Medico-Chirurgical Society. He became known as one of the most eminent authorities of his day on diseases of the skin. His published writings include *The Journal of the Leprosy Investigation Committee*; *Skin Affections in Syphilis*; articles on leprosy and other diseases of the skin in Allbutt's *System of Medicine*, and many papers on pathological and dermatological subjects in the transactions of medical societies.

ABRAHAM A SANTA CLARA, ā'brā-hām ā sänk'tā or ä'brā-hām (1644-1709). A popular German preacher and writer, whose real name was Ulrich Megerle. He was provincial prior of the Augustinians and court preacher at Vienna.

Uncouth puns, coarse expressions, an original and genuine humor marked his numerous and successful sermons and other religious works. He lashed the follies of all classes of society and in particular exposed the vices of courtiers and court life. He was an honest, faithful, and devoted priest, as was proved, among other things, by his self-sacrificing conduct during the plague in 1679. His collected works aggregate 21 vols. (1835-54). Of these the best known is *Judas der Erzschem* (1686-95) in 4 vols.

ABRAHAMITES, ā'brā-hām-īts; or **BOHEMIAN DEISTS**. The name under which a number of Bohemians, trusting to the edict of toleration issued by Joseph II, avowed themselves (1782) as believers of the doctrine alleged to have been held by Abraham before his circumcision. As early as the ninth century a sect of the same name had arisen in Syria and had denied the divinity of Christ. But the Bohemian deists professed to be followers of John Huss, though they held no Christian doctrine beyond that of the unity of God and accepted nothing of the Bible save the Ten Commandments and the Lord's Prayer. As they would join neither Jewish nor Christian sects, the Emperor refused to tolerate them and in 1783 expelled them from their native land and scattered them in various parts of Hungary, Transylvania, and Slavonia, where many were made converts to the Roman Catholic church, while others died clinging to their simple creed.

A'BRAHAM-MEN'. A class of sturdy beggars in England who feigned lunacy and wandered about the country in a disorderly manner. They were common in Shakespeare's time and, it would seem, existed even as late as the period of the Civil Wars. The term is used rather loosely. "An Abram cove," as Decker, in his *English Villanies*, calls one of those mendicants, meant one who personated a "Tom o' Bedlam." He would "disguise himself in grotesque rags, with knotted hair, long staff, and with many more disgusting contrivances to excite pity," but did not hesitate to live by thieving, too; when detected in pilfering or in any species of depredation, he pleaded the immunities of a Bedlamite. This word originally connoted an inmate of the lunacy ward of Bethlehem Hospital, London, under the patronage of the patriarch Abraham. Wearing a badge for identification, such a person when discharged was formally permitted to roam about the country and solicit alms. Many mendicants took wrongful advantage of this privilege and preyed upon the charitable. The meaning of this term is still preserved in the slang phrase "to sham Abraham."

ABRAHAM, PLAINS OF. A part of the elevated plateau on which stands the city of Quebec, and practically forming the west and southwest boundary of the city. It took its name from a St. Lawrence pilot. It was the scene of the battle on September 13, 1759, in which the English, under Gen. James Wolfe, defeated the French under Marquis de Montcalm, thereby bringing about the capitulation of the city on September 18, and the transfer to Britain of French sovereignty in North America. Both Wolfe and Montcalm were killed in the battle. A monument 40 feet high, erected in 1849, marks the spot where Wolfe expired. Not far distant a monument 60 feet high was erected in 1828 to the memory of Wolfe and Montcalm. In 1908 the jail and rifle factory which stood on the

Plains were removed and the battleground was made a public park. For details of the battle and the surrender of Quebec, see WOLFE, JAMES.

A'BRAHAM'S BOS'OM. A term used to designate the abode of bliss of the blessed, not only among Jews but among Christians. Lazarus reclining in Abraham's bosom was a figurative expression. In Byzantine and mediæval art the souls of the blessed are represented as being taken into Abraham's bosom in the form of little children. Abraham is the central figure in the fore-court of heaven.

ABRAHAMS, ISRAEL (1858—). An English (Jewish) author and lecturer, born in London and educated at Jews' College, London, and the University of London. For a time he was senior tutor at Jews' College, and was then appointed reader in Talmudic and Rabbinic Literature in Cambridge University. He was president of the Jewish Historical Society of England in 1905, and was first president of the Union of Jewish Literary Societies. In 1907 he was honorary president of the University of Glasgow Theological Society. Throughout a period of 19 years (1889–1908), he edited the *Jewish Quarterly Review*. His published writings include *Aspects of Judaism* (1895); *Jewish Life in the Middle Ages* (1896); *Chapters on Jewish Literature* (1899); *Maimonides* (1903); *Festival Studies* (1905); *A Short History of Jewish Literature* (1906); *Judaism* (1907); *Rabbinic Aids to Exegesis* (1910); *The Book of Delight, and Other Papers* (1912). He contributed to Jewish periodicals and became widely known as a lecturer on Jewish subjects.

A'BRAHAM THE JEW AND THE MERCHANT THE'ODORE. A mediæval tale of the conversion of a Jewish money-lender, after occurrences in which figures prominently the miracle-working power of the great image of Christ in the copper market at Constantinople. Theodore, in financial straits, twice borrows money of Abraham on the security of his oath before the statue, and only after repeated losses does he find, while on a foreign shore, means to repay the loan. For lack of other mode of transmission the merchant trusts his box of money to the sea. It is carried by the waves safely home to the Jew, who denies, however, after the return of Theodore, that he has received it. The Christian's prayer before the image, where he has brought Abraham to take oath, leads the Jew to confession of the Christian faith.

ABRAMS, ALBERT (1863—). An American physician, born in San Francisco. He studied medicine at the University of Heidelberg and, after taking the degree of M.D. in 1882, did post-graduate work in London, Berlin, Vienna, and Paris. In 1893 he was appointed professor of pathology in the Cooper Medical College, a chair which he held for five years. The Emmanuel Polyclinic in San Francisco made him its president in 1904. He wrote much on medical subjects, among his published volumes being *Synopsis of Morbid Renal Secretions* (1892); *Manual of Clinical Diagnosis* (1894); *Consumption—its Causes and Prevention* (1895); *Scattered Leaves of a Physician's Diary* (1900); *Diseases of the Heart* (1901); *Nervous Breakdown* (1901); *Hygiene, in a System of Physiologic Therapeutics* (1901); *The Blues* (1904; 4th ed., 1911); *Diseases of the Lungs* (1905); *Self-Poisoning; Diagnostic Therapeutics* (1909); *Spinal Therapeutics* (1909); *Spondylotherapy* (1910; 3d ed., 1912).

ABRANTES, á-brän'tësh. An ancient town in Estremadura, Portugal, situated on the north bank of the Tagus, 70 miles northeast of Lisbon (Map: Portugal, A 3). It is strongly fortified, is surrounded by walls, and is protected by a castle. It is remarkable for the architectural features of its monastery. By way of the Tagus, Abrantes has a brisk trade with Lisbon in grain, olive oil, wine, and fruit. Pottery and spirits are manufactured, and there are iron foundries. Fairs are celebrated in February and May. From this town Marshal Junot took the title of Duke of Abrantes. Pop., 1900, 6500.

ABRA'SIVES (Lat. *ab*, away + *radere*, to scrape, scratch). The natural and artificial substances used in the arts for scraping, grinding, and polishing. The principal abrasives now used are corundum, emery, garnet, quartz, carborundum, diatomaceous earth, tripoli, pumice, rouge, crushed steel, abrasive stones, powdered glass, and sand.

Corundum (q.v.) is a crystalline mineral substance, large deposits of which are mined in North Carolina. The process of manufacturing corundum ore into an abrasive powder consists in crushing and grinding it to a powder, which is mixed with water and fed onto sieves or screens; the properly ground material passes through the screens, and the coarser powder remains on top and is reground. The remainder of the process consists in refining and sizing the powder into eight or ten grades for the market.

Emery is an impure grade of corundum, and is prepared for the market by crushing, screening, and sizing, like corundum proper. Emery is used in the form of powder for grinding metal surfaces to intimate contact, for polishing plate glass and stones, and also as emery paper and as emery wheels. Emery paper or emery cloth is paper or cloth covered with hot glue and dusted with powdered emery. Emery wheels are disks of emery particles cemented by an adhesive cement and compressed under heavy pressure. Powdered emery is used also in the lapping process of grinding cylinders to size and producing a smooth surface. A disk or cylinder of soft metal is made to revolve rapidly and the powder with oil or water fed to the area in contact with the work. The particles embed themselves in the soft metal and abrade effectively. Valves are ground to their seats with powdered emery, to make them air- or gas-tight.

Garnet (q.v.) occurs in segregated masses scattered through other rocks. Formerly the process of production was to separate the garnet masses from the barren rock by hand after the rock had been broken down by picks or by blasting. This method of separation resulted in the loss of a considerable portion of the garnet in the rock, and a process has recently been perfected by which the rock is crushed by machinery and the garnet separated from the barren rock by water. Garnet is harder than quartz, and, unlike quartz, does not wear smooth, but by its cleavage presents new cutting edges. It is used chiefly in the form of garnet paper or as a facing for cylinders, disks, belts, etc., for smoothing and finishing wagons, cars, carriages, wooden parts of bicycles, furniture, etc., and in boot and shoe manufacture for smoothing and polishing the heels and soles.

Carborundum is an artificial product manufactured by a single American company whose works are at Niagara Falls, N. Y. The raw material for carborundum manufacture consists

of 34.2 parts coke, 54.2 parts sand, 9.9 parts sawdust, and 1.7 parts salt. This mixture is smelted by electricity in special furnaces of fire-brick 16 feet long, 5 feet high, and 5 feet wide. In the centre of the end walls are the terminals or electrodes, each of which consists of 60 carbon rods 30 inches long and 3 inches in diameter, into the outer ends of which small pieces of $\frac{3}{8}$ -inch copper rods are fixed. A square copper plate bored with 60 holes holds the carbon electrodes in place. The carbons having been put in place from the inside of the furnace, the spaces between them are tightly packed with graphite, which prevents the oxidation of the carbons and adds materially to their durability. The charge is next thrown into the furnace until it is a little more than half full, when a semi-circular trench about 21 inches in diameter is made the full length of the furnace. Into this trench the core of coke is placed and built up to form a cylinder 21 inches in diameter. Around this core more material is packed to the full height of the side walls, and heaped above their tops, the furnace then being ready for operation. This consists of passing an electric current through the charge between the two terminals, which is maintained for 36 hours, after which the furnace is allowed to cool slowly for 24 hours, when the side walls are torn down and the charge removed. The carborundum forms a layer about 10 or 12 inches thick around the coke core. This is crushed and treated with dilute sulphuric acid for three days at a temperature of 100° C. to remove the iron and alumina. The clean material is then washed with water, dried, and graded according to fineness. Carborundum is used like emery and garnet in the manufacture of abrading cloth, cylinders, wheels, etc., and in the form of powder for polishing stones, steel balls, etc.

Diatomaceous or *infusorial earth* (q.v.) is a natural product consisting of the siliceous framework of diatoms which is ground and used principally in polishing metals and finishing wood.

Tripoli is distinguished from infusorial earth by the mode of origin, it being the porous silica left from a siliceous limestone from which the lime has been leached, leaving the silica. The natural product is ground in a mill and sifted for use in polishing metals, horn, shell, etc., and is also cut out into the form of disks and used in household filters for filtering water.

Rouge as usually sold is made by dissolving iron in sulphuric acid so as to form iron sulphate; this salt is heated and the sulphur driven off, leaving a residue of sesquioxide of iron, which after washing is known as rouge. Rouge is used for polishing plate glass.

Crushed steel and *steel emery* are manufactured preferably from pieces of high-grade crucible steel heated to a temperature of about 2500° F. and then quenched in a bath of cold water or other suitable hardening solution which gives the steel a granular structure. The pieces are then reduced to powder by powerful hammers or crushing machines, after which the steel particles are tempered in the following manner: they are placed in a steel pan or cylinder and heated to a temperature of 450° F., and then cooled by being subjected to cold air in various ways. The final process is the grinding and sizing of the powder. Steel emery is made exactly like crushed steel, but is given an intensely hard temper. Crushed steel ranks close to the

diamond in hardness. Crushed steel and steel emery are extensively used in stone sawing and polishing, in lens grinding, glass beveling, brick grinding, and by lithographers, engineers, and plate glass manufacturers.

Grindstones are cut from a hard sandstone of a peculiar quality, and *whetstones*, *scythestones*, and *oilstones* are quarried and cut from similar natural rocks. *Millstones* or *buhrstones* are cut down or built up from various kinds of rock; the American buhrstone is a quartz conglomerate which is known under various local names; the German buhrstone is a basaltic lava, and that which comes from France and Belgium is a hard, porous material consisting of small particles of silica in a calcareous cement. The foreign stone is brought into the United States in small pieces, which are cut and built up into wheels with cement, but the domestic stone is worked down from quarry blocks into a solid wheel of the required size. Millstones are used for grinding grains, cement, pigments, etc. *Sand* is extensively used as an abrasive in the form of sandpaper and in the sandblast for cleaning castings, structural iron-work, etc. *Powdered glass* or sand is used in sawing stone to size and in surfacing it. *Pumice* (q.v.) is a volcanic ash or tufa which may be ground into powder for scouring and polishing or sold in lumps for similar purposes. For a detailed description of the occurrence and preparation of abrasives, reference should be made to the *Annual Reports of the United States Geological Survey, Mineral Resources of the United States*, which also include statistics of production and importation. See SANDBLAST; SANDPAPER.

ABRAVANEL, à-brä'vá-něl'. See ABRABANEL.

ABRAX'AS, or **ABRAXAX**. A term used by the Gnostic sect of Basilides to designate the multiform manifestation of the Supreme Deity in the universe, because when the word is written with Greek letters, these letters, computed numerically, have the value of 365, which equals the solar year and the number of *eons* or worlds that formed the total Gnostic universe. The word, in harmony with the magical tendencies of the East in the second century, was engraved on precious stones and used as an amulet. These gems often bore strange figures of Gnostic deities, sometimes part lion, or serpent, or cock, some connected with Jewish, some with Egyptian, and some with Græco-Roman worship. They are characteristic of the hybrid religious movement that fought for supremacy with Christianity. In many cases the figure represented has the head of a cock, the body of a man, and two serpents instead of legs, and is armed with a whip and shield, with the inscription IAΩ

(*iaō*), derived from the Hebrew name for God. Other divine manifestations inscribed or represented on the gems are Sabaoth, Adonai, Eloï—Hebrew names for God—Astaphaios, Ialdabaoth, Chnouphis. Others have names or figures of Jewish angels (Michael, Gabriel, Uriel, Onoel); others those of Egyptian gods (Isis, Osiris, Phtah, Neith, Hathor, etc.);

others those of Greek gods and heroes (Zeus, Hecate, Aphrodite, Hercules). It is a fact that the Christian Church and the Christian emperors of the fourth and fifth centuries found it far more difficult to stamp out



ABRAXAS STONE.

magical beliefs and practices than those of official paganism, and of this these stones are the clearest proofs. See ABRACADABRA and AMULET. Consult Barzilai, *Gli Abraxas* (Trieste, 1873); King, *The Gnostics and their Remains* (London, 1887); Kraus, *Real Encyklopädie der christlichen Altertümer* (Freiburg, 1882-86); Dieterich, *Abraxas, Studien* (Leipzig, 1891); Schultz, *Documente der Gnosis* (Jena, 1910).

ABREAST'. See BEARING.

ABRIDG'MENT (OF. *abrigier*, Lat. *abbreviare*, to shorten). A condensation or abbreviation of a book or treatise. In the law of copyright an abridgment, when fairly made, is deemed a new work, and consequently its publication is not an infringement of the copyright. An abridgment is to be distinguished in the law of copyright from a compilation. The former is a condensation of the substance of the copyrighted article, while the latter is a reproduction in part, at least, of the language of the copyrighted article and is held to be an infringement. Abridgments of the rules of law by various writers have been of great importance in the development of the English common law. Before our modern methods of reporting decided cases, the abridgments of Comyn, Viner, Bacon, and others were highly valued as text-books and were the chief repositories of legal learning. They are still valuable as authorities as to the rules of the early law.

ABROC'OMAS AND ANTHI'A. One of the oldest works of Greek prose fiction; also known as *Ephesiaca*, or *the Loves of Anthia and Abrocomas*. It was by an otherwise unknown writer named Xenophon of Ephesus, of uncertain date, supposed to have lived about the time of the Antonines. It is in simple narrative style, but abounds in improbable incidents. The story is the ultimate source of *Romeo and Juliet*.

AB'ROGA'TION (Lat. *abrogatio*, from *ab*, away + *rogare*, to ask, propose a law). In law, the annulling or repealing of a former law by an act of the legislative body. Abrogation may be accomplished by express provision of the later act, which in general terms abrogates all laws inconsistent with the new one, or names specifically the laws to be abrogated, in which case the abrogation is said to be *express*. Abrogation may also be *implied*, as where the new law is necessarily inconsistent with earlier laws. In Scotland, also, though not in England or the United States, when a statute by lapse of time has ceased to be suitable to the times and conditions, it is impliedly abrogated. The repeal of a statute revives any provision of the common law which such statute had abrogated or amended, but does not restore to life a previous statute which it had abrogated. See REPEAL; STATUTE.

ABROLHOS, à-brōl'yōs. A group of islands and shoals, 50 miles off the east coast of Brazil and 50 miles east of Caravellas, belonging to the State of Bahia. The largest island of the group, Santa Barbara, in lat. 18° S., 50 miles from Caravellas, is the site of a lighthouse (Map: Brazil).

A'BRUS (Gk. ἄβρός, *habros*, graceful, pretty). A genus of Leguminosæ, the best-known species, *Abrus precatorius*, being a shrubby climber of the tropics. The seeds, often called "crab's eyes," are bright scarlet with a black spot, and their use for rosaries by Buddhists suggested the specific name. In India the seeds are also used as standards of weight. The

roots have the properties of licorice. This species has also been called "weather-plant," from its imagined power to prophesy the weather, but this property has proved to be a superstition rather than a fact. The seeds are poisonous.

ABRUZZI, à-brōōt'sê, **E MOLISE**, ma'lê-zā. A division (*compartimento*) of Central Italy, situated between the Apennines and the Adriatic Sea, and comprising the provinces of Teramo (Abruzzo Ulteriore I), Chieti (Abruzzo Citeriore), Aquila (Abruzzo Ulteriore II), and Campobasso (Molise) (Map: Italy, H 5). The area is 6380 square miles. It comprises the wildest and loftiest portion of the Apennines. The rent and jagged mountain groups are very picturesque and reach in Il Gran Sasso d' Italia, or 'the great rock of Italy,' the highest of the chain, the elevation of 9584 feet. The highlands are clothed with luxuriant forests and slope precipitously on all sides, but especially toward the northeast shore. The rivers are numerous, but mostly very short, and, with the sole exception of the Pescara, are of little importance. The climate of the Abruzzi is raw in the higher regions; snow rests on the mountains from October to April, and on some of the peaks all the year round. While the mountain slopes provide ample pasture for numerous herds of cattle and swine, fertile valleys yield olives, rice, saffron, wine, and grain in abundance. Animal products form the chief article of export. Silk is produced to some extent, and cutlery is manufactured, but the industries are of little importance. In former times the district was considered of much strategical importance, owing to its inaccessibility, which rendered it especially fit as a protection for Naples. Pop., 1881, 1,317,215; 1901, 1,441,551; 1911, 1,575,084. Consult A. de Nino, *Usi e costumi abruzzesi* (Florence, 1879-91).

ABRUZZI, Prince LUIGI AMEDEO of Savoy-Aosta, Duke of the (1873—). An Italian traveler and Arctic explorer. The son of ex-King Amadeus of Spain, he was born in Madrid, and studied at the naval college in Leghorn. In 1897 he attracted much attention by making the first ascent of Mt. St. Elias. On June 12, 1899, he set out on his voyage toward the North Pole, his plan being to leave his ship, the *Stella Polare*, in harbor, and send northward a series of sledge expeditions. He spent one winter in the Bay of Teplitz, and would have remained a second had not a serious injury to the vessel compelled his return. One of his sledge parties, under Captain Umberto Cagni, attained the latitude of 86° 33', 239.15 statute miles from the Pole. On Sept. 6, 1900, he returned to Christiania. His explorations determined the northern coast of Franz-Josef Land and the non-existence of Petermann Land. The story of this expedition is told in his book, *On the "Polar Star" in the Arctic Sea* (1903). He also wrote *The Ascent of Mt. St. Elias* (1900). He established a new record in mountain climbing in 1909 by ascending Mt. Austen in India to a height of 24,600 feet. It was several times reported and denied in 1908 that he was engaged to Miss Katherine Elkins, daughter of Senator Stephen B. Elkins, of West Virginia.

AB'SALOM (Heb., 'father of peace'). The third son of King David (2 Sam. iii. 3; 1 Chron. iii. 2), whose romantic career makes him a prominent figure in Old Testament history. His mother was Maacah, the daughter of Talmai, King of Geshur (see ARAMEANS). Encoun-

tering the ill-will of David through slaying Amnon, the oldest son of the King, in revenge for an outrage committed by Amnon upon his sister Tamar (2 Sam. xiii), Absalom was banished from his father's court, and more than five years elapsed before he was again admitted into the presence of his father (2 Sam. xiii. 38; xiv. 28). A complete reconciliation, however, appeared out of the question, and Absalom shrewdly laid his plans to ingratiate himself in the hearts of the people (2 Sam. xv. 1-6). When the moment appeared ripe, he organized a rebellion against David, which soon assumed such dimensions as to force the King and his court to leave Jerusalem and fly for refuge to the east of the Jordan. Absalom entered Jerusalem, and the rebellion would probably have been successful but for the crafty intrigues of Hushai, who, while pretending to espouse the cause of Absalom, gave counsel which enabled David and his adherents to obtain time for gathering a following (2 Sam. xv. 17). A decisive battle was then fought "in the wood of Ephraim" (2 Sam. xviii. 6), in which Absalom lost his life. According to the narrative, Joab, chief counselor of David, sent three darts into Absalom's heart while he was hanging from an oak, in the branches of which his flowing locks, while he was riding, became entangled. With Absalom's death the rebellion came to an end (2 Sam. xviii. 7-17). David is represented as having been profoundly grieved at the death of his son; and the author of 2 Sam. ix-xx, probably a contemporary, tells the story in a manner calculated to arouse at least partial sympathy for Absalom, who is described as a youth of extraordinary beauty and attractiveness (2 Sam. xiv. 25-27). The date of Absalom's death may be fixed approximately at 1000 B.C. He was buried near the spot where he died, and the grave was marked by a great heap of stones (2 Sam. xviii. 17). He had set up for himself a pillar in the King's dale near Jerusalem during his lifetime (2 Sam. xviii. 18), like the Phœnician 'Abd Osir (Cooke, *North Semitic Inscriptions*, xvi, 1), and this pillar was shown in the time of Josephus (*Ant.* vii, 10, 3). The remarkable monument in the Kidron valley, now called Absalom's tomb, was assigned to Hezekiah by the Bordeaux pilgrim (333 A.D.), and apparently not before the fourteenth century, in the sources of *The Travels of Sir John Maundeville*, to Absalom. Thrupp supposed that Jesus, in Matt. xxii. 29, refers to this and its companion structures as tombs of the prophets built and garnished by the Pharisees (*Ancient Jerusalem*, 1855, pp. 230). Spiers, in Wilson's *Recovery of Jerusalem*, 1871, called attention to the confused style, the Egyptian cavetto cornice mounted on a Doric entablature, carried by Ionic semi-detached columns, with corner pilasters of the Græco-Syrian type, as indication of late Jewish but pre-Christian origin. Clermont Ganneau has plausibly suggested that the monument is the tomb of Alexander Jannæus, mentioned by Josephus, *Bell. Jud.* v, 7, 3 (*Survey of Western Palestine: Jerusalem*, 1884).

ABSALOM AND ACHITOPHEL, à-kit'ò-fël. The title of a poetical satire by John Dryden, published in 1681. Absalom represented the Duke of Monmouth, illegitimate son of Charles II, whose character is said to have resembled that of the rebellious son of King David. Achitophel, David's disloyal adviser, stood for the Earl of Shaftesbury, against whom the satire

was directed. It was intended to justify King Charles II as against the Whig party. As a political document it was extremely effective, and it has been highly praised for its vigorous literary qualities. The second part, published in 1682, was added by Nahum Tate.

ABSALON, äb'sä-lon (1128-1201). A Danish ecclesiastic, statesman, and general. He was educated at Paris and during the reigns of Valdemar I and Canute VI served as minister and general. In 1158 he was chosen bishop of Roskilde and in 1178 became archbishop of Lund. His highest position was that of papal legate. Absalom aided in the formulation of the code of Valdemar, and to his influence is due the *Historia Danica* of Saxo Grammaticus.

ABSAROKA, äb'sä-rõ'ká. See CROW INDIANS.

AB'SCESS (Lat. *ab, abs*, away + *cedere*, to go, Gk. ἀπόστημα, *apostēma*, distance). A circumscribed cavity, newly formed in the body tissues, containing pus, and due generally to an injury, followed by the invasion of the microorganisms of suppuration. An abscess is thus formed: first, the capillary vessels become overcharged with blood, in consequence of inflammation. The blood current is slowed, and an escape of serum and white blood corpuscles takes place through the thin vessel walls. The white corpuscles endeavor to destroy the invading bacteria by eating them (this process being known as *phagocytosis* and the defending cells as *phagocytes*), while the serum furnishes certain chemical substances which are at once stimulating to phagocytic activity and inimical to the bacteria. Many white cells perish in the combat, and these, together with many still active phagocytes, bacteria, and altered serum (*liquor puris*), are seen, under the microscope, to compose pus. By gradual dissolution of the surrounding tissues, the cavity is enlarged and the pus makes its way ("points") in the direction of least resistance either to the skin surface or to an adjoining natural cavity. A tubercular abscess is called a "cold abscess" because it presents no symptoms of inflammation. Its contents are not true pus, since the tubercle bacillus is not a pus-producing organism. Cold abscesses frequently make their way to regions far removed from their point of origin. In local infections superficially seated—either in or close under the skin—the early treatment consists chiefly in promoting the formation of pus by the application of moist, warm poultices, or limiting the process by the application of ice. The next step is the removal of the pus and provision of drainage. When this is too long delayed, "blood poisoning" or pyæmia may follow. An abscess must be regarded not as a disease in itself, but as the result of disease, or as an effort of nature to remove injurious matters from the system. See BACTERIA; SUPPURATION.

ABSCHATZ, äp'shâts, HANS ASSMANN, Freiherr von (1646-99). A German poet of the second Silesian School. He was born at Würbitz, and studied at Strassburg and Leyden. He was appointed life deputy from the principality of Liegnitz to the Silesian Diet at Breslau in 1679. Patriotic in tone and simple in style, he was well known in his day. He translated the *Pastor Fido* from the Italian of Guarini. His *Poetische Uebersetzungen und Gedichte* were published after his death (edited by Christian Gryphius, 1704). Selections also appear in vol. vi of W. Müller's *Bibliothek deutscher Klassiker*

des siebzehnten Jahrhunderts (1824). Consult C. H. Wegener, *Biographie Assmans von Abschatz* (Berlin, 1910).

ABSCHIEDS-SYMPHONIE, äp'shêts-zêm-fö-nē' (Ger. 'Farewell Symphony'). A symphony composed by Haydn, dated 1772 on the autograph score. It was written as an appeal to the Prince Eszterházy to allow the musicians leave of absence. One after another stopped playing and left the orchestra, and Haydn's object was attained through this delicate hint. See HAYDN.

ABSCIS'SA. See ANALYTIC GEOMETRY.

ABSCOND'ING (Lat. *abs*, away + *condere*, to put up). In law, the act of leaving the state or concealing oneself therein for a fraudulent purpose, such as hindering, delaying, or defrauding one's creditors. It is not a common-law offense for one to go beyond the boundaries of his country, nor to treat his house as his castle, that is, as a place into which an officer has no right to break in order to serve civil process. But if a debtor goes abroad or conceals himself to avoid the service of legal process, the creditor, being unable to employ the usual methods, is entitled, upon resorting to the proper proceedings, to seize the defaulting debtor's property. The rights of creditors against absconding debtors are now generally regulated by statute. See ARREST; ATTACHMENT; BANKRUPTCY; INSOLVENCY; LIMITATION OF ACTIONS.

ABSECON, ab-sē'kon. A bay just north of Atlantic City, N. J. It has a circumference of about 5 miles and has as its principal entrance Absecon Inlet. At the mouth of this inlet, in lat. 39° 22' N. and long. 74° 25' W., is a lighthouse of the first class, 165 feet above sea level.

AB'SENTEE'. A capitalist, especially a landowner, who derives his income from one country and spends it in another. Ireland offers the classic example of absenteeism and its attendant economic and social evils. A large part of the land is owned by members of the aristocracy, who administer their affairs by agents and rarely visit their possessions. This state of affairs dates in the main from the union with Great Britain and the transfer of Parliament from Dublin to London. Under the various land purchase acts, since 1885, many of the estates of absentees, as well as of other large holders, have been broken up and sold to the actual occupiers. See IRISH LAND LAWS.

There is a general consensus of opinion that absenteeism is hurtful to the economic interests of a region. It removes from the country its natural leaders, those whose personal concern in the upbuilding of the country is essential to public welfare. It intensifies the struggle between classes and makes coöperation difficult. It is likely to result in misuse of the land by owners more bent upon securing maximum financial returns than upon maintaining and increasing its earning capacity, while the management of the paid overseer is not tempered by the spirit of *noblesse oblige* which generally prevails when the landlord is a resident.

ABSENTEE, THE. A story by Maria Edgeworth (q.v.), published in 1812. It was one of the series called *Tales of Fashionable Life*, or *Fashionable Tales*.

AB'SHERON, ab'sheron. See APSHERON.

ABSINTHE, äb'sinth (Fr., from the Gk. ἀψίνθιον, *apsinthion*, wormwood). A bitter liquor, the base of which is an alcoholic solution of certain essential oils derived from a number of

plants. The chief source is a form of wormwood, or absinthium (*Artemisia absinthium*). (For illustration, see Plate of ACANTHUS.) The leaves and tops of this plant, together with portions of angelica root (*Archangelica officinalis*), sweet-flag root (*Acorus calamus*), dittany (*Cunila mariana*), star-anise seeds (*Illicium cerum*), and other aromatics, are macerated in alcohol for eight days and then distilled. The product is an emerald-colored liquor, to which anise oil is added, and which constitutes the genuine French *extrait d'absinthe*. Other absinthe of inferior quality is made from various herbs and essential oils, and adulterations are numerous. Two kinds of absinthe are known in commerce, French and Swiss; the latter, prepared from highly concentrated spirits, being the more trustworthy. The chief places of manufacture are Neuchâtel in Switzerland and Bordeaux in France. The product is consumed mostly in France, though large quantities are exported to the United States. Absinthe was first used by the French soldiers in the Algerian War (1844-47), who mixed it with their liquor as a febrifuge, and who later introduced the habit in France.

Absinthe when excessively used gives at first a feeling of exhilarated intoxication. Later the digestive organs are deranged, the appetite destroyed, then thirst, giddiness, ringing in the ears, hallucinations of sight, heavy mental oppression, anxiety, loss of brain power, and idiocy may succeed each other. It induces a condition of alcoholic intoxication plus the poisoning by the essential oils, notably by that known as absinthol, contained in the wormwood. See ARTEMISIA; LIQUEUR; WORMWOOD.

AB'SOLON. A character in Chaucer's *Miller's Tale*. He was a parish clerk, who fell in love with the jealous carpenter's wife, but ludicrously failed in his suit.

AB'SOLUTE (Lat. *absolutus*, brought to a conclusion, final, complete, from *absolvere*, to loosen from, bring to a close, complete). A term employed in philosophy and theology with various meanings, but in every case in direct antithesis to the term *relative*. In logic, absolute terms are (a) those that do not connote (see CONNOTATION) and at the same time do not imply attributes, and (b) those which do not imply the existence of some other term, as, for instance, "buyer" implies seller, such terms being known as relative. It is seen, however, that relativity is almost universal, as it is impossible to define any term without showing it to be relative to some other term. Many theological philosophers speak of God as absolute, meaning thereby that He *need* stand in no relation to anything distinct from Himself. Absolute means here independent of essential relations to other objects. Herbert Spencer speaks of absolute ethics, meaning ethics dealing with a standard that is unchanging, as opposed to the relative ethics of any particular place or time. With the Hegelians absolute means all-inclusive; essential relation is included in such a conception, but merely external relation is excluded: the universe, in the sense of all existence, including all the relations binding everything to everything else, is absolute in this meaning of the word; and the universe alone is absolute. Much of the discussion about the possibility of the absolute has turned upon the ambiguity of the word. So also with the question whether there can be knowledge of the absolute. If by the absolute is

meant something that exists in itself apart from all knowledge, and if knowledge is considered as a relation between two independent things, the knower and the known, then knowledge of the absolute is impossible. This is Sir William Hamilton's (q.v.) contention, and also Spencer's (q.v.). If knowledge means exhaustive comprehension of every objective detail within the unity of a single consciousness, and yet if consciousness and its object are not looked on as independent of each other, then absolute knowledge would be possible on the supposition of the existence of a being that sustains all reality within its unchanging consciousness (T. H. Green). If knowledge is not synonymous with exhaustive knowledge, and yet if the object of knowledge is regarded as essentially related to the consciousness that knows, and if such an object also stands in essential relation to every other object, then all knowledge is partial knowledge of the absolute. Consult W. H. Moberly, *Foundations, a Statement of Christian Belief* (London, 1912), and Roulleaux Dugage, *Théorie des principes de l'absolu* (Paris, 1909). See KNOWLEDGE, THEORY OF; LOGIC.

ABSOLUTE, CAPTAIN. A leading character in Sheridan's *The Rivals*, the son of Sir Anthony Absolute. He is a young soldier, and the lover of Lydia Languish, to gratify whose impractical and romantic temperament he makes his suit in the assumed guise of a penniless adventurer, Ensign Beverley. He thus wins her heart and proves himself his own successful rival.

ABSOLUTE, Sir ANTHONY. A celebrated character in Sheridan's comedy of *The Rivals*. He is a choleric and apparently obstinate old gentleman, who is, however, at bottom entirely kind-hearted. He avows his excessive irritability in the first act: "No, no, Mrs. Malaprop. Jack knows that the least demur puts me in a frenzy." But when finally the lovers in the play are united, he shows himself most jovial and sympathetic.

ABSOLUTE MUSIC. A term denoting music written for its own sake, without encroaching upon the domain of any other art, appealing directly to the emotion without intervention of the intellect. The term came into general use about the middle of the last century, when the adherents of the new school of program music began their propaganda for the symphonies of Berlioz (q.v.) and the symphonic poems of Liszt (q.v.), which at that time were regarded by the more conservative musicians as a spurious form of art. To-day the claims of program music are fully recognized, and the expressions "Absolute" and "Program music" are only generic titles. See INSTRUMENTAL MUSIC; PROGRAM MUSIC.

ABSOLUTE VALUE. In the development of mathematics several artificial number systems have been formed, which are used in connection with the primitive system of natural numbers, e.g., negative numbers, $-1, -2, -3, \dots$ imaginary numbers, $\sqrt{-1}, \sqrt{-2}, \dots$ and complex numbers, $3 + \sqrt{-1}, 2 - \sqrt{-3}, \dots$ The natural number which, multiplied by (-1) , equals a given negative number, is called the absolute value of the negative number; thus, the absolute value of -2 , expressed $|-2|$, is 2. Similarly, the positive value of the coefficient of $\sqrt{-1}$ in an imaginary number is called the absolute value of the imaginary number; thus,

the absolute value of $\sqrt{-3}$ (or $\sqrt{3} \sqrt{-1}$), expressed $|\sqrt{-3}|$, is $\sqrt{3}$. The modulus of a complex number (q.v.) is called its absolute value; thus, the absolute value of $3 + \sqrt{-2}$, expressed $|3 + \sqrt{-2}|$, is $\sqrt{3^2 + (\sqrt{2})^2}$. The name "absolute value" and the vertical rules to denote it are due to Weierstrass.

ABSOLUTION. The remission of sin, or of the punishment due to sin, by the Church. The remission of sin and its penalties may be divided into sacramental and canonical—one relating to the *forum internum*, the proclamation of pardon to the sinner, and constituting the most important part of the sacrament of penance; the other to the *forum externum* and devoted especially to the remission of ecclesiastical censure. Censure is expressed in spiritual punishments imposed by the Church, by which a person is deprived of the use of certain spiritual goods, as the sacraments, until penitent for his sins. Their early history is closely connected, as in the first ages of the Church all grievous public sins incurred the penalty of absolute separation from the assembly of the faithful, and reconciliation could be obtained only by undergoing the penance imposed by the Church. The bishops were the chief ministers of absolution; but the whole body of the faithful were consulted as to the term of the public penance, since they, as well as God, were injured by the sin. With the gradual decrease of severity and of public penances, absolution was pronounced by the priest immediately after confession, if he judged the repentance sincere. Formal excommunication, however, could even in later days be remitted only by public absolution by the bishop or his deputy, and certain sins are still "reserved" to the same authority for judgment. The power of judicial absolution in the name of God is attributed by Roman Catholics to all priests, on the basis of the commission in John xx. 23; the Protestant churches generally ascribe only a declarative power to their ministers, though the Church of England retains the absolute form in the Order for the Visitation of the Sick. The form of absolution, since none was given by Christ, has varied considerably; the Western Church down to the twelfth century, with rare exceptions, and the Eastern churches to the present time employing a deprecatory form ("May Christ absolve thee," etc.), for which the indicative form, *Ego absolvo te*, was definitely substituted by the Council of Trent. The difference in form, however, has implied no change in doctrine. For the Catholic doctrine, see Taunton, *The Law of the Church* (London, 1906). See CONFESSION; DISCIPLINE, ECCLESIASTICAL; PENANCE.

ABSOLUTION, DAY OF. See GOOD FRIDAY (so called from the ancient practice of emphasizing forgiveness upon that day).

ABSOLUTISM (Lat. *absolutus*, complete, unrestricted, from *ab*, away + *solvere*, to loosen, free). That system of government in which the supreme power is vested in a ruler unchecked by any constitution or laws. It characterized all the ancient monarchies (a brief period in the case of the Roman Empire excepted), and has prevailed in all Oriental monarchies, down to Japan of a few years ago. The barbarian invasions replaced the absolute monarchy by feudalism in Western Europe, but with the growth of towns and the rise of the commercial classes came the necessity for a strong central

government to protect the nation against the feudal barons, and the absolute king once more arose, master of a regular army, uniting in himself the different functions of the national life, religious as well as political. A mild form of absolute monarchy is familiar to the student of English history in the House of Tudor, with its strong-willed monarchs; but a representative absolute monarch of modern times is better seen in Louis XIV of France with his famous assertion, *L'état c'est moi* ('I am the state'). There are now no absolute monarchies in Europe. The revolution of 1908 in Turkey and the resultant constitution make the term no longer applicable, even to the Ottoman Empire.

ABSORBENTS. See LACTEALS; LYMPHATICS.

ABSORPTION (Lat. *ab*, away + *sorbere*, to swallow). When certain fluids are brought together, the molecules of one mix intimately with those of the other, and *diffusion* takes place. If certain solids containing fluids are brought in contact with other liquids, some of the liquid passes into the solid, and *absorption* takes place. Gases may also be absorbed similarly. Diffusion acting through an animal or vegetable membrane is called *osmosis*. Much of what is termed absorption in physiology is really osmosis. It is by this process of absorption that the elements of nutrition are taken from the intestines and conveyed to the tissues they are to nourish; the bones absorb much calcareous matter from the blood, cartilages less, and muscles less still; the brain takes more water than does muscle, and muscle more than bone. Most of the tissues of living bodies have the power of absorbing fluids—a property that often continues after death and until decomposition begins. Animal substances differ in absorbing power according to differences in the liquid, notably if they differ in specific gravity and if the fluids in the substances brought in contact are miscible. The following table from Chevreul shows the amounts of liquid absorbed by various tissues in twenty-four hours:

100 Parts of	Parts of Water	Saline Solution	Oil
Cartilage	231	125	
Tendon	178	114	8.6
Elastic ligament	148	30	7.2
Cartilaginous ligament.	319		3.2
Cornea	461	370	9.1
Dried fibrin	301	154	

Absorption of oxygen by the blood in the lungs is apparently instantaneous, the change in color from dark red to bright red as soon as it arrives at the pulmonary vessels showing the action of the gas it has taken from the atmosphere. This rapidity of absorption is due to the fact that in the circulation of the lungs the blood is spread out in the fine capillaries over a very large area, and to the incessant motion of the blood in the capillaries. See LACTEALS; LYMPHATICS.

ABSORPTION, ELECTRICAL. A phenomenon observed in electrical condensers (q.v.), in which the dielectric or insulating material between the conductors is non-homogeneous, e.g., a piece of glass. It is noted that if such a condenser is charged, then discharged and allowed to stand for a short time, there will appear another

charge. If this is discharged, another charge will soon appear. These secondary charges are said to be due to electrical absorption. See ELECTRICITY.

ABSORPTION, IN PLANTS. The process by which substances are taken into the body. A few plants only, being devoid of any external cover to the protoplasm, are able to engulf particles of food, which may then be digested. The most prominent of these are the Myxomycetes (q.v.), or slime molds, which in the period of their vegetative activity consist of a mass of naked protoplasm (called a plasmodium), sometimes as large as one's two hands. These plasmodia, like huge Amœbæ (q.v.), creep about and envelop particles of decaying organic matter, etc., on which they feed. The zoöspores, or reproductive bodies, of some Algæ and Fungi are also microscopic bits of naked protoplasm, but they probably do not ingest solid food during this period. Inasmuch as the protoplasm of most plants forms on its surface, as the first step of development, a thin jacket of cellulose or some similar material, the taking up of solid substances is thereby absolutely prevented. Whether the body consist of one cell or many, it presents to the surrounding medium a continuous membrane with no visible openings. Through these cell walls, therefore, neither solid nor gaseous substances can pass without previously undergoing solution. The organs of absorption are all surface cells in the simpler plants. In larger land plants they include the moist cells bordering the intercellular spaces and the surface cells of the younger roots including the root hairs. (See AERATION and ROOTS.) The materials whose absorption is to be explained are (1) dissolved substances or solutes, and (2) the solvent, water.

1. **Solutes.** Although the protoplasm itself and its surrounding membrane (the cell wall) contain a large amount of water (50–98 per cent), as yet it is not known to what extent the water lies between the particles of the substances named and to what extent it is held as water of hydration or even dissolved in the medium itself. Since a water film wets the outer face of the walls and perhaps even pervades the wall and certain layers of the protoplasm, the solutes must go into solution in the water in order to enter the cell. Two factors are most important in determining the entrance or rate of entrance of solutes; permeable characters of the walls and protoplasm and the steepness of the concentration gradient of the solutes. In multicellular plants the action of these two factors is probably supplemented by circulation of the protoplasm and by the transpiration stream. The former aids diffusion in distributing the solutes, and the latter concentrates the solutes in the leaves or other transpiring parts. Both make the gradient more steep at important regions. The unsuberized walls of absorbing cells generally offer little resistance to the movement of solutes. (See PERMEABILITY.) The protoplasm, or certain layers of it, on the other hand, determines in the main what enters the plant and the rate of the entrance. It entirely prevents the passage of some solutes, permits others to enter only slowly and still others readily. The permeability of different cells of the same plants or of cells of different plants varies greatly; also the permeability of the same cells under different conditions varies considerably with

conditions (temperature, light intensity, presence or absence of anæsthetics, etc.). If any substances be removed from solution through use or storage, they will continue to be supplied from the regions of greater abundance, and consequently of greater pressure, to the regions of lesser pressure, i.e., where they are being used. The fact that different amounts of a given compound enter plants growing in the same soil is explicable in part on this basis and in part on permeability. Thus, wheat and clover may grow side by side; the ash of the wheat will contain 67.5 per cent of silica, while that of the clover contains only 2.5 per cent.

2. **Water.** The plant absorbs and holds water by two main processes: imbibition (q.v.) and osmosis (q.v.). The structures of the plant taking up water by imbibition are wood, cell walls, starch, and protoplasm and its constituents. (See COLLOIDS.) The force involved in imbibition is often enormous. The desiccated starch grain swells in water with a pressure of more than 5000 atmospheres, while air-dry seeds swell with a pressure of about 1000 atmospheres. The force of imbibition falls rather rapidly as the imbibed water increases. It was thought formerly that imbibition is due to the attraction of the surfaces of the composing particles. Now it seems probable that the water may be loosely tied up chemically with the swelling material as water of hydration. The mature living plant cell is a typical osmotic machine. First, there is the surrounding cell wall, which in general permits the free passage of solutes and acts as a bracing apparatus for the protoplasm. Next is the thin layer of protoplasm lining the wall. This is in part a semipermeable membrane permitting the rather free passage of water, but entirely prohibiting the outward diffusion of many solutes of the vacuole and greatly restricting the movement of others. Finally, the vacuole, filled with water bearing various solutes, occupies the central region of the cell. (See GROWTH.) The solution of the vacuole takes up water by osmosis (q.v.), thus stretching the protoplasm and wall and producing turgidity (q.v.) of the cell. The amount of osmotic pressure exhibited by plant cells varies greatly. In many it varies from 3 to 10 atmospheres, in some from 15 to 40 atmospheres, and in a few (leaves of certain desert plants, pollen grains, etc.) it is more than 100 atmospheres. When the cell does not contain enough water to use the total osmotic pressure of the vacuole for stretching the protoplasm and wall, it is said to have a saturation deficit. In such condition it will absorb water from regions where it is held less tenaciously (adjoining cells, soil water, or bathing solution). If the saturation deficit becomes great enough, the protoplasm is drawn from the wall and plasmolysis (q.v.) results. The joint action of imbibition and osmosis accounts for the absorption of water by all parts of the plants, as well as the movement from one region to another. The movement is always from regions where the water is held with less force (imbibition or osmotic) to regions where it is held with greater force. Transpiration, therefore, in any region causes a movement in that direction. The absorption of water by swelling seeds is largely a matter of imbibition, for they bear little soluble material. The absorption of water by roots or an algal filament from its bathing solution is largely a matter of osmosis, though of course involving imbibition by such

structures as walls, protoplasm, and starch grains.

ABSORPTION OF GASES. The phenomenon of the taking up or absorbing of gases by liquids and solids. The number of cubic centimeters of a gas which can be absorbed by one cubic centimeter of a given liquid at 15° C. is called the "absorption coefficient" of the liquid for the gas. The absorption coefficient of water for ammonia is 756; for carbon dioxide, 1.0; for chlorine, 2.4. The mass of the gas absorbed varies directly as the pressure; so, if a gas is forced into a liquid under high pressure, and if the pressure is afterward released, the gas will be evolved. This is what happens in the case of beer and aerated waters. The absorption of gases by solids is called *occlusion*. The most conspicuous illustration of this is the power of palladium to occlude 900 times its own volume of hydrogen.

ABSORPTION OF WAVES. Waves of any kind in any medium carry energy with them; and if the energy decreases, the medium is said to absorb it or to exhibit "absorption." Thus, if white light falls upon red glass, i.e., if ether waves which affect the normal human eye with the sensation "white" are incident upon glass which appears red to the same eye, all the waves except those which produce the sensation red are absorbed by the glass, while the others are transmitted. Bodies differ greatly in the quality and quantity of their absorptive power; but it is a general law that the absorptive power of a body equals its emissive power under the same conditions. (See RADIATION.) Absorption is due to the presence in the pure medium carrying the waves of some portions of matter whose own natural period of vibration is the same as that of the period of the waves, and therefore these portions of matter are set in vibration by "resonance" (q.v.). Thus, if a person sings a pure note near a piano, it may be observed that the particular string of the piano which of itself gives the same note is set in vibration by the air waves sent out by the singer.

If air waves of any length fall upon a soft body, such as a cushion or a curtain, there is absorption, as is shown by the fact that the reflected waves are much less intense than the incident waves. (See ACOUSTICS.) The energy thus absorbed is not spent in emitting other waves, but is dissipated throughout the body producing heat effects. Similarly, if ether waves fall upon an absorbing body, the energy absorbed is dissipated in general throughout the smallest particles of the body producing heat effects. See, however, FLUORESCENCE.

ABSTINENCE. See FAST.

ABSTINENCE SOCIETIES. Associations to promote total abstinence from alcoholic liquors as beverages. See TEMPERANCE.

ABSTRACTION (Lat. *abs*, away + *trahere*, to draw). In logic, the process by which the mind separates out marks or characteristics which are similar in various objects and disregards the marks or characteristics by which the objects differ. It also occurs where characteristics of particular objects, or classes of objects, are replaced by a more general characteristic. The result of this process is also called an abstraction, or, if it appears as a word, a concept. In psychology, the term "abstraction" means the emphasis of certain contents of consciousness and the suppression of others. The abstraction may be the result of frequent and regular associa-

tions (Associative Abstraction). For example, the word "gas," for some persons, habitually means "illuminating gas." The reason is that in past experience this particular kind of gas has been the most frequent and regular associate of the word "gas." Doubtless there have been occasional associations with other forms of gas, but these, in accordance with the law of frequency, are less likely to appear upon the presentation of a stimulus. (See ASSOCIATION OF IDEAS.) The result is that, in the formation of meanings, the frequent associations are unconsciously separated—*abstracted* from those which are merely accidental. The abstraction may also be the result of a determination (Determined Abstraction), as when we pick out only those features in a situation to which our attention has been directed, or to which we are otherwise predisposed, and reject the other features. (See DETERMINING TENDENCY.) The determined abstraction may be either simultaneous or successive. An example of the latter is seen in reaction experiments where the observer, who has perhaps been instructed to react as quickly as possible upon the appearance of a *white card*, gradually and unconsciously changes his instruction so that he reacts to *something white*. In most if not in all determined abstractions two kinds of determination may be observed. The determination may be positive, an instruction to act in a certain way, or a direction of attention to certain aspects of a situation; or it may be a negative determination, which results from a predisposition on the part of the observer to follow the course offering the least resistance. A combination of the associative abstraction and the determined abstraction has also been distinguished. Consult: R. H. Lotze, *Logic* (Oxford, 1888); N. Ach, *Ueber die Willenstätigkeit und das Denken* (Göttingen, 1905); E. B. Titchener, *A Text-book of Psychology* (New York, 1910).

ABSTRACT OF TITLE. A brief and orderly statement in writing of the successive conveyances and other events through which a person claiming to own a parcel of land derives his title. A purchaser or mortgagee of real property is entitled—by law in England, by custom in the United States—to receive such an abstract from the vendor or mortgagor in advance of the consummation of the transaction, and it thereupon becomes the basis of the examination of title (q.v.), which it is the duty of the solicitor or attorney of the purchaser to make. A perfect abstract should furnish a complete history of the title sought to be transferred, showing not only the origin and nature of the vendor's interest, but also all incumbrances and other interests—such as mortgages, easements, recorded judgments, trusts, etc.—which affect his title. In England, where the practice of recording deeds does not generally obtain, the abstract is based upon the title deeds (q.v.), which are carefully preserved and transmitted with each transfer of the estate; while in the United States the public records of conveyances are the principal, but not the exclusive, source of the information upon which the maker of the abstract proceeds. Consult: Warvelle, *A Practical Treatise on Abstracts and Examinations of Titles to Real Property* (Chicago, 1892); Warvelle, *A Treatise on the American Law of Vendor and Purchaser of Real Property* (Chicago, 1902); Comyns, *On Abstracts of Title* (London, 1895). See RECORDING OF DEEDS.

ABSURDUM, REDUCTIO AD (Lat., a reducing to an absurdity). The method of proving a truth by showing that to suppose the proposition untrue would lead to a contradiction or absurdity.

ABYSR'TUS, äb-sir'tüs (Gk. "Ἀψυρτος, *Ap-syrτος*). In the legend of the Argonautic expedition (see ARGONAUTS), the younger brother of Medea. She carried him off with her when she fled with Jason from Colchis, and, according to the common version of the story, deterred her pursuing parent, Æetes, by cutting the boy in pieces and scattering his body on the sea for his father to gather up.

ABT, äpt, FRANZ (1819–85). A German song writer and musical conductor. He was born at Eilenburg and sent to the Thomasschule at Leipzig to be educated. Here he met Mendelssohn, who is said to have persuaded him to follow a musical career. He was appointed kapellmeister at the court theatre of Bernburg in 1841, but soon relinquished this position for a similar one at Zürich, where he remained for 11 years, obtaining great popularity as a teacher, composer, and leader of singing societies. He was called to Brunswick in 1852 as second musical director at the court theatre, was appointed court kapellmeister in 1855, and pensioned in 1881. He came to the United States in 1872 at the invitation of several choral societies, and everywhere met with a cordial reception. Abt was a prolific composer, and at the time of his death had published nearly 600 books (Hefte), some of them containing from 20 to 30 numbers. He belongs to that group of composers which includes Truhn, Kücken, and Gumbert. His vocal compositions are remarkable for their simplicity and clearness of melodic construction. Some of these, as *Wenn die Schwalben heimwärts zieh'n* ('When the Swallows Homeward Fly'); *Gute Nacht, du mein herziges Kind* ('Good Night, My Child'); *Schlaf wohl, du süsser Engel* ('Sleep Well, Sweet Angel') have become real folk-songs.

ABU, ä'bōō. One of the Aravalli Mountains (q.v.), India, 5653 feet high. It is held in high esteem by the Jainas and is celebrated for its two magnificent temples of white marble, supposed to have been built in the twelfth and thirteenth centuries, and considered the finest specimens of Indian architecture.

ABU, ä'bōō. The Arabic word for 'father,' occasionally abbreviated to *Bu*. A man is sometimes known as the father of his son, e.g., Abu Yusuf, Abu Dawud; or he is described as being a father, i.e., acting as one, in his relation to animals, e.g., Abu Bekr, 'the father of a camel's-foal,' nicknamed by his enemies Abu Fasil, 'the father of the weaned calf,' Abu Huraira, 'father of kittens'; or he may be characterized as the father, i.e., the possessor of some quality, e.g., Abu'l Fadl, 'father of grace,' 'the graceful one,' Abu'l Fida, 'father of devotion,' 'the devout one.' In all such instances this is not the real name of the person but a kunya, surname or nickname, which, however, may be so commonly used as to cause the real name to fall into oblivion. Such a *kunya* may also be applied to an object or a place, e.g., *Abu'l hawl*, 'father of terror,' the sphinx at Gizeh, *Abu'l fulus*, 'father of money,' frequently used as the name of a place where treasures are supposed to be hidden.

ABU-BEKR, ä'bōō-bëk'r (his original name was 'Abd al-Ka'bah ibn Abi Kuhafah al Atik)

(570-634). When converted to Islam, he took the name Abd Allah; the origin of his *kunya*, or surname, Abu-Bekr, is not known. That it meant 'father of the camel's foal' seems clear from the nickname Abul Fasil, 'father of the weaned calf,' which his enemies gave him. The first Caliph, father-in-law of Mohammed. He was a man of great influence in the Kuraish tribe. In 632, when Mohammed died, he was chosen as the successor of the Prophet with the title *chalifa rasu 'l allahi*, or representative of, substitute for, the messenger of Allah. After defeating his enemies in Arabia and warring successfully against Persia and the Byzantine Emperor Heraclius, Abu-bekr died (634 A.D.) and was buried at Medina, near the remains of Mohammed and the Prophet's wife Ayeshah (q.v.).

ABU-BEKR MOHAMMED AL-RAZI, ä rä'zè. See RHAZES.

ABU-BEKR MOHAMMED IBN TOPHAIL, ä'bōō-bēk'r mō-hām'mēd 'b'n tō'fā-ēl (1100-85). A famous Arabic physician, mathematician, poet, and philosopher. He was born in Andalusia and died in Morocco. His chief extant philosophical work is entitled *Hai ibn Yaḳzān*, 'the Living, the Son of the Awake.' It depicts the natural progressive development of the human faculties in a Robinson Crusoe born on an island till nature and God are known. To secure this communion, positive religion is valuable for the vulgar, but religious doctrines are only exoteric presentations of the mystic truth. The name of the hero and the subject are borrowed from Ibn Sina (Avicenna), with this difference, that while Ibn Sina's hero possesses a supernatural intellect, that of Ibn Tophail personifies a man of ordinary faculties. Later translations: Francisco Pons y Boigues (Saragossa, 1900), and Léon Gautier (Paris, 1909); also P. Brönnle, *The Awakening of the Soul* (London, 1905).

ABU HANIFA, ä'bōō hā-nē'fā, AL NU'MAN IBN THABIT IBN ZUTA (699-767 A.D.). Moslem jurist, and founder of the school of the Hanafites. (See MOHAMMEDAN SECTS.) He was born in Kufa. His grandfather was brought to this city as a slave from Persia. His vast erudition in canon law drew large numbers of hearers to his lectures. To maintain his independence he earned his living as a clothier, and was averse to holding any public office. As an adherent of the cause of Ali he at first sympathized with the Abbassids, but later became opposed to them, and may have suffered at the hands of the authorities. It is impossible to determine how much of truth there is in the story that he was scourged by al Mansur for refusing to accept a judgeship, and died in prison from the consequences. His decisions and sayings were recorded by his disciples. See Snouck Hurgronje in *Revue de l'histoire des Religions*, xxxvii, 186; Sprenger in *Zeitschrift für vergleichende Rechtswissenschaft* (x, pp. 15 ff.); Brockelmann, *Geschichte der arabischen Literatur*, vol. i (1898, pp. 169 ff.).

ABU-HASSAN, ä'bōō-hās'an, surnamed THE WAG. The hero of *The Sleeper Awakened*, one of the stories of the *Arabian Nights*. He was a citizen of Bagdad who entertained the Caliph unawares and as a result met with several interesting experiences, finally becoming the trusted friend and favorite of the Caliph.

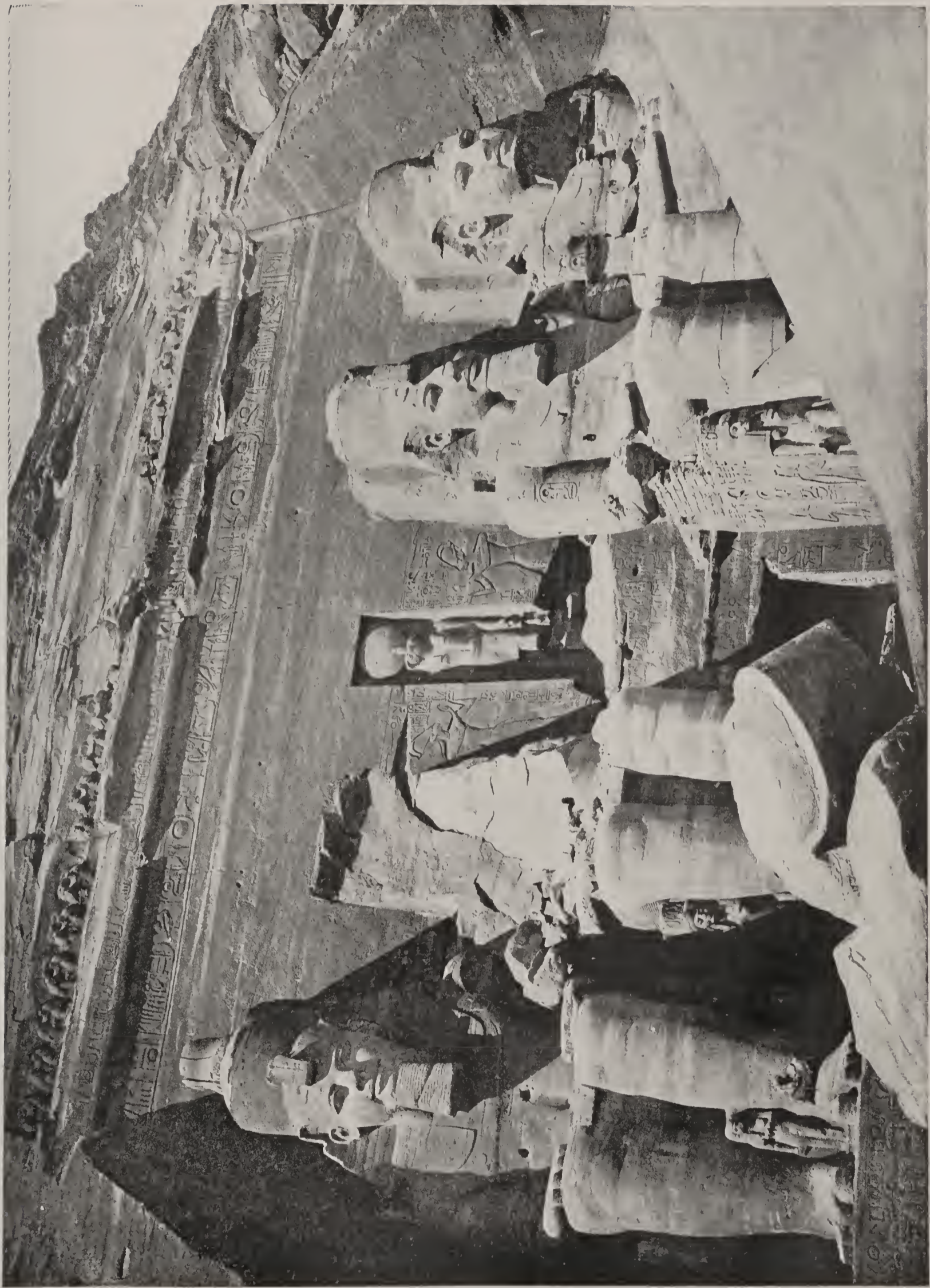
ABUKIR, ä'bōō-kēr'. An insignificant village on the coast of Egypt, about 13 miles northeast

of Alexandria, probably the ancient Bukiris. The important city of Canopus was situated in the near vicinity. The castle of Abukir stands on the west side of the bay of the same name, which is west of the Rosetta branch of the Nile. This bay is celebrated on account of Nelson's victory here gained over the French fleet, Aug. 1-2, 1798, the engagement being frequently called the Battle of the Nile. The French fleet was stationed in a curved line near a small island guarded by a battery; but Nelson, with his usual intrepidity, forced a passage with half of his fleet of fifteen vessels between the island and the French line of battle, while the other half attacked the enemy in front. The French admiral De Bruyes was killed by a cannon-ball, and his flag-ship, *l'Orient*, was destroyed. The French fleet was completely defeated, and only two vessels escaped. Napoleon defeated the Arabs here on July 25, 1799, and Sir Ralph Abercromby (q.v.) repulsed the French near this point in 1801 (the engagement being known as the battle of Alexandria).

ABU KLEA, ä'bōō klā'ā. A place in the Sudan situated on the route between Korti and Metemme, both of which are on the great bend of the Nile below Khartum. It was the scene of a battle fought on Jan. 17, 1885, in which the Mahdi's forces were defeated by the English troops under Sir Herbert Stewart. See MAIDI.

ABU'L ABBAS, ä'bool ā-bās'. The name of the first Abbasid Caliph was Abd Allah, but he was generally called Abu'l Abbas, and gave himself the *kunya*, or surname, Al Saffah, 'the bloodshedder.' His father, Mohammed ibn Ali, was great-grandson of the uncle of the Prophet. On this relation to the Prophet the Abbasids based their claim to the Caliphate. The black flag was unfurled in Khorasan in 747. Kufa was captured, and Abu'l Abbas proclaimed himself there as Caliph in 749. Marwan II was defeated in 750 and soon after killed; and Abu'l Abbas massacred all whom he could find of the family of the Banu Umayya. He died in 754, leaving the caliphate to his brother Abu Ja 'far al Mansur. See Muir, *The Caliphate* (3d ed., 1899, pp. 426 ff.); Wellhausen, *Das arabische Reich* (1902, pp. 338 ff.).

ABU'L ALA, AL MA'ARRI, ä'bōōl ā'lā āl mā-ā'rè (973-1058). One of the greatest of Arabic poets and a profound thinker. He was born at Ma'arrat al Nu'man, a little city in northern Syria, between Aleppo and Emesa. When he was four years of age, he became almost totally blind. He was educated at Aleppo, Tripoli, and Antioch. At first he was strongly under the influence of Mutanabbi (q.v.), but his independent mind did not fit him for a court poet. In the preface to *Sikt al Zand* he says: "I have never tickled the ears of princes with songs of praise nor praised any one of them in the hope of being rewarded." Abu'l Ala lived in Ma'arra until 1010. Then he went to Bagdad, where he apparently met with little success. He returned with his mother to Ma'arra and resided there until his death. He was a vegetarian and an ascetic. The purity and disinterestedness that characterized him, added to his fame as a poet, attracted many earnest persons to his little town. His earliest work was a collection of songs, *Sikt al Zand*, written in the style of Mutinabbi. In his collection, the *Lazumiyat*, he reveals that trenchant criticism of popular religious ideas which marks his maturer years. He deals not only with re-



ABU-SIMBEL
STONE RELIEFS AT ENTRANCE OF ROCK TEMPLE

ligious, but also with social and political questions, always seeking for fundamental truths. In his *Risalat al Ghufuran*, or 'Letters of the Forgiven,' he produced an extraordinary satirical sketch of the life of the forgiven heretics of the past in the other world. Abu'l Ala was neither a Moslem nor a Christian, but a believer in the absolute sovereignty of ethics. See Kremer, *Ueber die philosophischen Gedichte des Abu'l Ala al Maarri* (1888); Nicholson, *A Literary History of the Arabs* (1907, pp. 313); Margoliouth, *The Letters of Abu'l Ala* (1906).

ABU'L ATAHYA, ä'bōol ä-tä'hī-yā. One of the greatest Arabic poets in the Abbasid period. Ismail ibn al Kasim, with the surname Abu'l Atahiya, was born at Anbar, on the Euphrates, in 748 A.D. He lived in Kufa, Hira, and Bagdad, and died in 825 A.D. A simple life, leading to asceticism, moral earnestness, and radicalism, characterizes him as a man. He is the first poet-philosopher among the Arabs and was looked upon as a free-thinker and an atheist. The popularity of his poetry was due to its great simplicity and brevity. A good edition of his poems in Arabic was published in Beirut in 1887. See Brockelmann, *Geschichte der arabischen Literatur*, vol. i (1898, p. 78).

ABU'L FARAJ, ä'bōol-fä-rāj', ALI IBN AL HUSAIN IBN MOHAMMED IBN AHMED AL KURASHI AL ISFAHANI (897-967). A famous Arabic historian. He was a descendant of the Umayyads, but born in Ispahan, Persia. He traveled extensively, and found eminent patrons such as Saif al Daula (q.v.) and the Buwaihid wazirs Isma'il ibn Abbad and al Muhallabi. His chief work is *Kitab al aghani*, 'The Book of Songs,' the most extensive source of our knowledge of early Arabic literature. It gives a large collection of songs, and in addition to each its melody, according to the musical terminology of Al Mausili, and notices concerning the author and often an anecdote concerning some famous male or female singer. The latest edition of the text appeared in Cairo in 21 vols., 1905-06. See Brockelmann in *Enzyklopaedie des Islam* (1908, p. 90).

ABULFARAJ, ä'bool-färāj or fä-rāj'. See BAR HEBRÆUS.

ABULFAZL, ä'bōol-fä'z'l, **MUBARAK - I ALLAMI** (1551-1602). Vizier and historiographer of Akbar (q.v.), the great Mongol Emperor. His chief work is in two parts: the first part (*Akbar Nāmah*, or 'Book of Akbar') is a complete history of Akbar's reign, and the second half (*Āyin-i-Akbar*, or 'Institute of Akbar') gives an account of the religious and political constitution and administration of the Empire. The style is excellent, and the second part is of unique and enduring interest. The Persian text of the *Akbar Nāmah* is edited in the *Bibliotheca Indica* (1873-87), and a translation has been issued by Beveridge in the same collection. The *Āyin-i-Akbar*, edited in the *Bibliotheca Indica* (1867-77), is translated by Blochmann and Jarett (1873-94) in the same series. Abulfazl was at the head of the great literary movement to which we owe the Persian translations of numerous Sanskrit, Arabic, and Hindu works. He died by the hand of an assassin while returning from a mission to the Deccan in 1602.

ABULFIDA, ä'bōol-fē-dä', Arabic Abu Al Fida Ismail Ibn 'Ali 'Imad Al-Din (1273-1331). A Moslem prince and historian. He was born at Damascus and belonged to a side branch of

the Ayyubid family. His father, Al Malik al Afdal, brother of Al Malik al Mansur, the reigning prince of Hama (the ancient Hamath, q.v.), had fled to this city before the Mongolians. During his youth he distinguished himself in several campaigns against the Crusaders, serving under his uncle. But when the principality was not given to him on the death of his cousin, Mahmud II, but to Emir Sankar, he transferred his allegiance to Sultan al Malik al Nasir. In 1310 he bestowed upon Abulfida the principality of Hama for distinguished military services. He was given practically sovereign powers. From 1310 to the time of his death he ruled over the principality and in 1320 was given the dignity of a Sultan and the right to transmit his title to his descendants. He visited Egypt and Arabia and patronized literature and science. Among his important writings were *An Abridgment of the History of the Human Race*, in the form of annals, from the creation to 1328. The work is partly a compilation and partly original. It deals first with pre-Islamic history and then with the history of the world since the prophet down to the year 1329. The text has been published at Constantinople, 1870, and there are several translations. For the period of the Crusades it is particularly important. A part is contained in the first volume of Muratori, *Scriptores Rerum Italicarum*. The part preceding the Mohammedan era was rendered into Latin by Fleischer as *Abulfedae Historia ante-Islamitica* (Leipzig, 1831); the part on the life of Mohammedan into English by W. Murray (London); and the later part by Reiske and Adler (*Annales Moslemici*, 5 vols., Copenhagen, 1789-94). The *Geography* of Abulfida is chiefly valuable for the history and description of the Mohammedan world. A complete edition was published by Reinaud and de Slane in Paris (1840); and a French translation was published by Reinaud (first part) in 1845 and Guyaud (second part) in 1883. See Brockelmann, *Geschichte der arabischen Literatur*, vol. ii (1902, p. 44).

ABUL-HASSAN, ä'bōol-häs'sän. See JUDAH, BEN SAMUEL.

ABULIA, ä-bōō'lī-ä. See PSYCHIATRY.

ABU'L KASIM, ä bōol-kä'sim. Halaf ibn Abbas Abu'l Kasim al Zahrawi, commonly called by earlier writers Abulcasis, or Alsaharavius, a distinguished Arab physician, was born at al Zahra, near Cordova, in the first half of the tenth century. He flourished under the Caliph Abd al Rahman III (912-961) and died in 1009. His great work, *al tasrif*, an encyclopædia of medicine, is of much interest. The treatise on surgery contained in it is the best that has come down from antiquity and is of importance for the history of medical science. A partial Latin translation of *al tasrif* was published in Augsburg in 1529, and a Hebrew translation exists in manuscript. The treatise on gynæcology was published by Caspar Wolf in his *Gynæcia*, 1566, and the section on surgery in Arabic and English by Channing, 1778. See E. Dognée, "Abulcasis, sa vie, son œuvre" in *Etudes dédiées à C. Leemans* (1885, pp. 304 f.); H. Frölich, "Abul Kasem als Kriegschirurg" in *Archiv für klinische Chirurgie* (1884, pp. 364-376).

ABUL KASIM MANSUR, ä'bōol kä'sēm mán-sōor'. See FIRDAUSI.

ABULUG, ä'bu-loog'. A town in the prov-

ince of Cagayan, in the island of Luzon, Philippines. It is situated on the Abulug River in a fertile valley which produces rice, tobacco, and grain. It is 14 miles northwest of Aparri, with which it carries on considerable trade. Pop., about 9000.

ABUL WEFA, ä'bōōl wā'fā. See MOHAMMED BEN MOHAMMED BEN YAHAYA.

ABUMESACKA, äbōō'mā-sä'kā (native name). A large catfish of the Nile (*Charotes laticeps*).

ABUNDA, ä-bōōn'dā. A Bantu people of Angola, living partly on the low-lying coastlands and partly on the terraced escarpments, and hence divided into "highlanders" and "lowlanders." They have long been in contact with Europeans, and there is a considerable admixture of white blood, largely accounting for their enterprise, which travelers praise highly. Most of them speak both Portuguese and Umbunda, a trade language which is current over vast areas. It is said that, with a knowledge of Umbunda and Ki-Swahili, also a Bantu dialect, a traveler can make his way across the continent from Benguela to Zanzibar.

ABUNLON, ä-bōōn'lōn. A name applied to the Negrito mixed-bloods of Zambales province, Luzon. See PHILIPPINES.

ABU NUWAS, ä'bōō nōō'wās, AL-HASAN IBN HĀNI AL-HAKAMI (756-810). One of the most celebrated Arabic lyric poets; born in al-Ahwaz; lived a riotous life in Basra, Kufah, and Bagdad, though under the special favor of Harun al Rashid and al-Amin. His collected poems contain 4900 verses. Those which celebrate wine are best known; but he also wrote love poems, satires (one of which was the cause of his death), poems on the chase and on asceticism, for he became an ascetic before his death. He has been called the Heine of Arabic literature. His *Diwan* has been edited and partly translated by von Kremer (Vienna, 1855) and Ahlwardt (Greifswald, 1861). Compare Brockelmann, *Geschichte der arabischen Literatur*, vol. i (1898, p. 75).

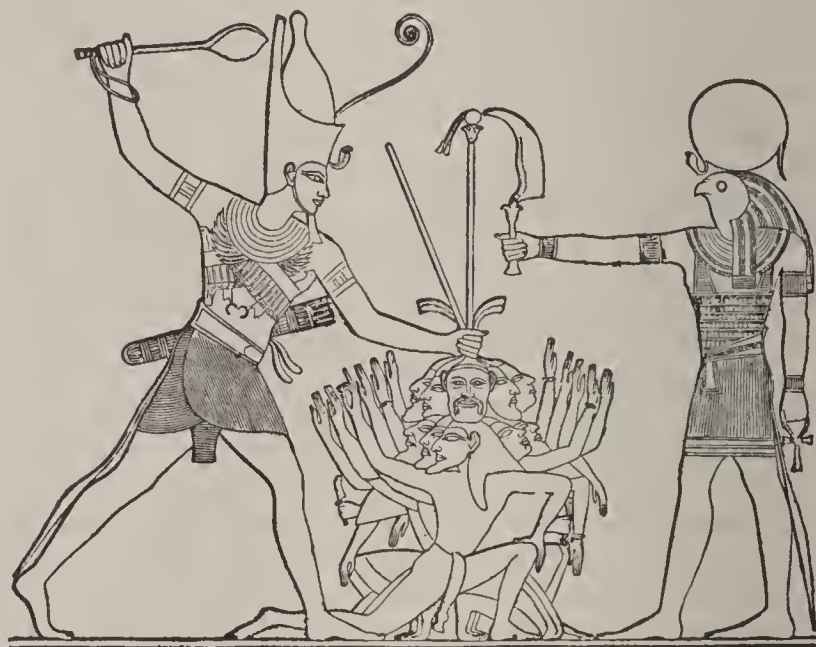
ABU SAID KHAN, ä'bōō säid kän. See MONGOL DYNASTIES.

ABUSE' OF PROC'ESS. The wrongful employment of a regular judicial proceeding. Courts of justice, quite as much for their own protection as for that of the party injured thereby, refuse to lend themselves to the abuse of their procedure, and may, accordingly, stay or dismiss actions and strike out defenses which are manifestly frivolous or vexatious. The jurisdiction to prevent or redress such abuse may be exercised on the motion of the party aggrieved or at the instance of the court itself. While an action will lie at the instance of the aggrieved party for the wrongful use of criminal process, a person wrongfully sued in a civil action has no legal redress, however unfounded, vexatious or malicious the suit may have been, unless it involves arrest or seizure of property. (See MALICIOUS PROSECUTION.) Consult Newell, *Law of Malicious Prosecution, False Imprisonment, and Abuse of Legal Process* (Chicago, 1892).

ABUSHEHR, ä'bōō-shēr', or **BUSHIRE**, bōō-shēr' (Pers. *Bendershehr*). A Persian seaport town on the east coast of the Persian Gulf, about 130 miles by caravan southwest of Shiraz (Map: Persia, D 6). It is situated at the extremity of a peninsula and has an extremely hot and unhealthy climate. Owing to its advantageous position as a terminal of one of the

most important caravan routes of Persia, Abushehr formerly had a very considerable trade, in spite of the fact that its harbor is neither safe nor deep enough for heavy vessels, which are compelled to anchor outside. The exports consist of opium, raw cotton and silk, mother of pearl, carpets, tobacco, and hides, while the imports include cotton goods, tea, metals, sugar, and spices. Abushehr is the seat of several European consuls, as well as of a Persian governor, but its importance has very much diminished, and its population has shrunk from about 15,000 to about 2000.

ABU-SIMBEL, ä'bōō-sim'bēl (IBSAMBUL or IPSAMBUL). A place on the left bank of the Nile in Nubia, lat. 22° 22' N., the site of two very remarkable rock-cut temples. Both were constructed by Rameses II, who dedicated the larger to the gods Ammon of Thebes, Harmachis of Heliopolis, and Ptah of Memphis; the smaller to the goddess Hathor. The larger temple has a façade 119 feet broad and more than 100 feet high, adorned with four sitting colossi, each



SCULPTURE FROM ABU-SIMBEL.

Rameses II slaying his enemies.

more than 65 feet in height, representing the King. Upon these are carved inscriptions commemorating the visit of Phœnician and Greek mercenaries in the service of King Psammetichus II (594-589 B.C.). The interior of this temple, which is 180 feet in depth, contains two large halls and 12 smaller chambers and corridors, all decorated with sculptures and paintings. The great outer hall, 58 by 54 feet, is supported by two rows of square pillars, four in each row, 30 feet high; and to each of these pillars is attached a standing figure of the King, reaching to the roof. The walls of this hall are decorated with representations, in color, of victories over the Hittites and other enemies of Egypt. In front of the smaller temple are six statues, each 3 feet high, representing King Rameses and his Queen. These temples were discovered by Burckhardt. In front of the temple is a wide terrace with a small temple. Across the whole front of the terrace is a row of statues—figures of the Pharaoh alternating with those of the sacred hawk of the sun. In 1892 Captain Johnston, R.E., repaired the front of the larger temple, and built two walls to protect the entrance against the drifting sand. In 1912 the great colossi of the temple façade were repaired by filling the cracks with liquid cement.

ABU TAMMAM, ä'bōō tām-mäm', HABIB IBN AUS (probably 807-846). An Arabic poet,

ABUTILON



1. FLOWERING MAPLE (*Abutilon venosum*).
2. APRICOT (*Prunus armeniaca*).

3. ALLSPICE (*Pimenta officinalis*).
4. BELLADONNA LILY (*Amaryllis Belladonna*).
5. AVOCADO PEAR (*Persea gratissima*).

and collector of poems, the exact dates of whose birth and death are uncertain. He was born in a village northeast of the Lake of Galilee in Syria, and his father is said to have been a Christian by the name of Todus, which Abu Tammam, after he had embraced Islam, represented as having been Aus. At an early age he came to Egypt, where he first became known as a poet. After a vain attempt to gain the favor of Al Mamun (813-833), he went to Mosul, where he spent many years. Al Mutasim (833-842) rewarded him openly for his praise-songs, and the poet accompanied him in his campaign against Amorium (838). He was a great traveler, and many anecdotes are told of his visits to prominent persons in different provinces. Once he was the guest of Ibn Raja in Fars. Accused of having neglected some of the religious practices of Islam, he expressed grave doubts as to the value of these customs, which almost cost him his life. He visited Armenia and Khorasan. On his return he was forced by a snowstorm to seek refuge with Abu'l Wafa ibn Salama in Hamadan, whose rich library was placed at his disposal. He there compiled four collections of Arabic poems. The most famous of these is known as the *Hamasa*—i.e., 'heroic' anthology. Though Abu Tammam achieved high renown as a poet, his reputation rests chiefly upon this anthology. The Arabic text of the *Hamasa* was published by G. W. Freytag in two volumes (Bonn, 1828-47), and an edition has also been published in Bulak (1869) and Calcutta (1856). The German poet Friedrich Rückert published a German translation of the *Hamasa* (Stuttgart, 1846). Consult Brockelmann, *Geschichte der arabischen Literatur*, vol. i (1898, pp. 84 ff.).

ABU'TILON (Ar. *ābūtilūn*), or INDIAN MALLOW. A genus of mostly shrubby tropical or semi-tropical plants of the natural order Malvaceæ, including about 70 species. A number of species, known as flowering maples, are grown like geraniums or fuchsias in pots in greenhouses and in summer planted out in borders. The leaves are long-stalked, often maple-like or vine-like, and generally edged or mottled with white; the flowers are pendant, one, two, or more inches long, varying in color from red to yellow and white and intermediate shades. The more commonly cultivated species are *Abutilon striatum*, *Abutilon Thompsoni*, *Abutilon venosum*, *Abutilon insigne*, etc. *Abutilon avicennæ*, known as velvet-leaf, is a common weed in different parts of the United States. See Plate of ABUTILON.

ABUT'MENT (Fr. *aboutir*, to end in, to touch by the extremity, from *bout*, end, compare Engl. *butt*). In architecture, that part of a wall or pier which takes the thrust of the construction above it, as of an arch, vault, or truss; the terminal piers or supports of an arcade or bridge. An abutment arch is the land arch of a bridge, or one of the terminal arches of an arcade.

ABU UBAIDA, *ābū-bī'dā*, MA'MAR IBN AL MUTHANNA (728-825 A.D.). An eminent Arabian philologist. He is said to have been of Jewish descent and was certainly not a member of the Taimite tribe. He defended bravely the rights of Moslems who were not Arabs. It is possible that he was a Kharijite (see MOHAMMEDAN SECTS), and was regarded as holding heretical views. Abu Ubaida was one of the ablest philologists of his time and knew inti-

mately the Arabic traditions and stories. See Goldziher, *Muhammedanische Studien*, vol. i (1889, pp. 194 ff.).

ABŪ-YŪSŪF YAKUB, *ā'bōo-yōō'suf yā'kōōb*, called AL-MANSŪR or 'The Victorious' (1160-98). The fourth Sultan of the Almohade dynasty in Africa and Spain. His father was killed at the siege of Santarem, 1184, and as soon as he had quelled certain insurrections in Morocco, Abū-Yūsūf Yakūb turned his arms against the Christians and carried off to Africa 40,000 captives. In subsequent expeditions he captured Torres and Silves, in Portugal, and defeated the Christians under Alfonso III, near Valencia. He died in Morocco. See ALMOHADES.

Ä'BY, *ä'bu*, CHRISTOPH THEODOR. See AEBY.

ABY'DOS (Gk. *Ἄβυδος*). 1. In ancient geography, a town of Asia Minor, situated at the narrowest part of the Hellespont, opposite Sestos. It is celebrated as the place near which Xerxes and his vast army passed into Europe in 480 B.C.; also as the scene of the story of Hero (q.v.) and Leander. The people of Abydos were proverbial for their effeminate and dissolute manners. 2. A city in Upper Egypt (Thebaïs), on the left bank of the Nile, on the main route of commerce with Libya. It is mentioned in the earliest Egyptian inscriptions, and, especially under the nineteenth dynasty, was a city of considerable extent and importance. Later it declined, and in the time of Strabo (q.v.), about the beginning of the Christian era, it was in ruins. This Abydos was celebrated as the burial place of Osiris (q.v.), and the bodies of pious Egyptians were brought thither for interment from all parts of Egypt. Magnificent temples, dedicated to Osiris, were built in this Abydos by Seti I and by his son Rameses II. In the temple built by the latter was found, in 1818, the first of the two famous tablets of Abydos, containing a list of Egyptian kings. The second and more important tablet was found in 1864 in the temple built by Seti I. The tablets are now in the British Museum. In recent years excavations conducted at Abydos by Amélineau and Flinders Petrie have brought to light important remains of the first Egyptian dynasty. See PETRIE, F., and also EGYPT.

AB'YDOS, BRIDE OF. A narrative poem in two cantos, by Lord Byron (published 1813). The heroine, Zuleika, is an Oriental character of ideal purity and beauty.

AB'YLA AND CAL'PE. See HERCULES, PILLARS OF.

ABYS'MAL ACCU'MULA'TIONS. Deposits which gather upon the bottom of the abysmal depths of the ocean. They consist chiefly of red and gray clays and the so-called ooze, which latter are combinations of the clays with the shells of minute organisms such as Radiolarians, Foraminifera, and Diatoms. For a more detailed description of these abysmal accumulations and other forms of deep-sea deposits the reader is referred to the article on OCEANIC DEPOSIT.

ABYSS' (Gk. *ἄβυσσος*, *abyssos*, bottomless, from *ἀ*, *a*, priv. + *βυσσός*, *byssos*, depth, bottom). A designation applied in the Greek translation of the Old Testament to the primitive "chaos" as described in Gen. i. 2. The Hebrew term—*tehôm*—occurs some 30 times, and was modified in the course of time to convey the notion of the "watery deep" in general surrounding the earth, on which, according to what ap-

pears to be a later conception, the earth was supposed to rest, and from which springs and rivers were fed. The situation of Sheol being, according to primitive Semitic ideas, in the depths of the earth, the term "abyss" is used in the New Testament (Rom. x. 7) as the designation for the abode of the dead, and then more specifically for the prison in which evil powers are confined (so in seven passages of Revelation, ix. 1, xi. 7, etc. See also Luke viii. 31). In the Revised Version of the New Testament the Greek term is rendered by "abyss," but in the Authorized Version and in both the Authorized and Revised Versions of the Old Testament expressions like "deep" and "bottomless pit" are employed.

ABYSSAL FAUNA. See DISTRIBUTION OF ANIMALS.

ABYSSINIA. A country in East Africa, situated between the Red Sea and the Anglo-Egyptian Sudan, and extending from about 3° to 15° N. lat., and 35° to 43° E. long. (Map: Africa, H 4). It is bounded by the Italian colony of Eritrea on the north, French, British, and Italian Somaliland on the east and south-east, British East Africa on the south, and the Anglo-Egyptian Sudan on the west; but its boundaries heretofore could hardly be drawn with precision on account of the changes caused by foreign treaties and frequent wars. Since 1908, however, there has been an agreement between England, France, and Italy to preserve, so far as possible, the boundaries existing at that date in this territory, which they designate as "Ethiopia," the ancient title. It comprises the kingdoms of Tigré, Amhara, Gojam, and Shoa, with Kaffa, and Galla land, and Central Somaliland and Harrar as territorial dependencies. Its area is approximately 432,600 square miles. The western half of Abyssinia is a plateau region with ranges of mountains rising from it, and it is in this part that the controlling kingdoms lie. The altitude averages from 7000 to 7500 feet, with a deep central depression at Lake Tsana (q.v.).

Of the numerous mountain chains in this region only a few can be clearly traced. The Simen group, situated at the northern end of the country, and inclosed by the bend of the Takazzé, has an average altitude of about 10,000 feet and rises in Ras Dashan (Dajan), over 15,000 feet above the sea. South of the Simen group is another chain, the Talba Wakha, surrounded by the upper course of the Atbara (q.v.) on its emerging from Lake Tsana. This chain is inferior in height to the Simen, its greatest elevation being only about 9000 feet above the sea. The southern part of the plateau is less mountainous, but abounds in so-called "ambas," isolated rocky hillocks, most of them very precipitous and difficult of ascent. Although at present it includes no active volcanoes, the country in its entire aspect bears evidence of violent volcanic eruptions in some remote age. Even to-day numerous extinct volcanoes are to be found, with their craters half obliterated, and there are several hot springs in the vicinity of Mount Entoto, some of them with a temperature of 170°.

Among the rivers the most important are the Abai, or Blue Nile (q.v.), the Atbara, or Black Nile, the Takazzé, the main head-stream of the latter, and the Hawash. With the exception of the Abai, none of these rivers is navigable, and all are liable to sudden rises, often accompanied

by great disasters. The largest lake is Tsana, called also Dembea.

In regard to climate and flora, the country may be divided into three zones. The first, embracing all the districts lying below the altitude of 4800 feet above the sea, and called Kollas, has an annual temperature ranging from 70° to 100° F., and an exceedingly luxuriant vegetation, including cotton, indigo, bananas, sugarcane, coffee, date palms, and ebony. The second zone, Woina Dega, includes all the country between 4800 and 9000 feet above the sea. It is characterized by a moderate temperature, ranging from 60° to 80° F., and its vegetation includes many of the grasses and cereals which flourish in Europe, besides oranges, lemons, olives, tobacco, potatoes, onions, the bamboo, the turpentine tree, etc. The third zone, Dega, which comprises all of the country situated above 9000 feet, has a temperature of 45° to 50°. It affords excellent grazing grounds, and its soil is well adapted for the cultivation of the hardier cereals.

The rainy season on the coast lands lasts from December to May. In the interior of the country there are generally two rainy seasons, one from April to June and the other from July to October. The climate is generally healthful.

The fauna is not inferior in variety to the flora. It includes, among other animals, the lion, the elephant, the rhinoceros, the giraffe, the leopard, a species of wolf (the kaberu), the hyena, hippopotamus, zebra, and several forms of antelopes. Consult Blanford, *Geology and Zoology of Abyssinia* (London, 1870). Among the domestic animals may be mentioned the horse, mule, donkey, camel, ox, sheep, and goat.

Geologically the surface of Abyssinia is composed mainly of sandstone, together with granite, basalt, trachyte, and other varieties of igneous rocks. The minerals include gold, which is found mostly in the streams, and also iron, coal, silver, and rock salt. For further information about the geology of Abyssinia, see AFRICA and GREAT RIFT VALLEY.

Industries. The soil of Abyssinia is very fertile, yielding two and sometimes three crops a year, and agriculture, especially in the north and among the Gallas, is the leading industry. The land is divided, not among individuals, but among families, and is subject to imperial or ecclesiastical control. The agricultural methods employed are of the most primitive kind. Various cereals are produced, the most important being barley, teff, and wheat. Numerous vegetables are raised, and coffee is a valuable crop, the fine Harrar-Mocha variety coming from the Harrar highlands. Different kinds of fruit, such as oranges, lemons, bananas, etc., are found in abundance. The raising of live stock, including sheep, goats, horned cattle, horses, and mules, is a very important industry. Most of the sheep are not wool-bearing. There are no manufacturing industries.

Trade. Foreign trade is entirely in the hands of foreign merchants, and is not considerable, as, until recently, the buying was done almost exclusively by the Emperor and his court. The increased security of life and property, however, which the Abyssinians enjoyed under Emperor Menelek, prompted an increasing number of them to part with their buried treasures of gold and silver in exchange for all kinds of goods. The value of the foreign trade is unknown, but is variously estimated at between \$5,000,000 and

\$10,000,000 a year; imports and exports about balancing each other. Jibuti forms the chief avenue of trade. Great Britain and the United States are the two leading sources of imports. France and Germany come next. The leading articles of import are cotton, silk, and arms. The chief articles of export are coffee, gold, ivory, skins, wax, and butter. Coffee is exported chiefly to Arabia, gold to India. The chief obstacles to trade are the primitive means of communication, resulting in slow and expensive transportation. A railway from Jibuti to Dire Dawa, 187 miles (of which 111 miles are in Abyssinia) was opened in 1902. Dire Dawa is about 25 miles from Harrar. The line is to be extended to Addis Abeba, and reached the Hawash River in 1912. It is constructed entirely by French capital. There are more than 1000 miles of telegraph line, connecting Addis Abeba and other towns with Jibuti, Massaua, and Harrar. The capital is also connected with Harrar by telephone.

The chief medium of exchange until about the beginning of the present century was the Maria Theresa dollar. Salt bars of uniform size and cartridges also circulate. A new currency introduced by the Emperor in 1894, with the Menelek dollar, or *tabari*, worth about 50 cents, as the standard, has gradually come into use. The Bank of Abyssinia, which was chartered in 1905 and has a capital of £500,000, was granted the privilege of minting the Abyssinian coinage, of issuing legal tender bank notes, and of engaging in all commercial, industrial, and financial transactions. The capital of the bank was mainly provided by the Egyptian National Bank, and it was expected to offset the influence acquired by France through the construction of the railway from Jibuti.

Government. In its form of government Abyssinia may be considered a sort of feudal monarchy. Menelek, the Emperor, or *negus negusti* ('king of kings'), was undoubtedly the real ruler of Abyssinia; but this position he owed more to his personal qualities than to any traditional rights. In 1907 a ministerial cabinet was established. Certain parts of the country are ruled by princes, or *rases*, some of them appointed by the Emperor, while others are sufficiently strong to defy his authority and may throw the country into a state of disorder at his death. The *rases* have retinues of supporters. This class of professional warriors, whose usefulness lasts as long as there are any insubordinate tribes to pacify, is a great hindrance to the development of the country. The revenue is derived from import duties, tithes paid in kind, and taxes on commodities, especially gold and ivory sold in the market. The collection of taxes is intrusted to the governors of the villages or *shums*, who are practically unrestricted as to the methods used or amounts collected. The legal system is supposed to be based on the Justinian code. Punishments are of barbaric severity. Blood feud still prevails. The Abyssinian army, numbering about 150,000, is largely composed of cavalry and is very well adapted for swift movements, as it is not encumbered by any commissariat, its maintenance being obtained from inhabitants of regions through which it passes. This system naturally makes for abuses. The regular army may be supplemented by irregular and provincial troops in case of need.

The political divisions of the empire, which

are subject to alteration, consist of provinces, or kingdoms, and dependencies; the following are the most important: (1) The kingdom of Tigré, occupying the northern part of the country north of the river Takazzé or Bahr-el-Aswad ('Black River'). Its chief towns are Antalo and Adowa. (2) The kingdom of Amhara, extending on the west of the Takazzé and including Gojam, which lies within the great curve of the Abai (upper course of the Blue Nile). The capital, Gondar, is situated in the northeast of the plain of Dembea or Gondar, at an elevation of about 7500 feet. (3) The kingdom of Shoa (including Efat), lying southeast of Amhara and separated from the Galla tribes by the Hawash. This is, by all accounts, the best organized and most powerful state now existing in Abyssinia.

Addis Abeba, founded by Menelek in 1892 as the capital of the country, has 60,000 to 80,000 inhabitants. The residence of Menelek was at Addis Alam, 20 miles west of Addis Abeba.

Population. The population is unknown; the estimates ranging from 3,500,000 as high as 8,000,000. The location of the people between the Nile and the Red Sea permitted the comingling of Hamites from the north, Himyaritic Semites from Asia, and negroes from the south. The Abyssinians are of medium stature; in color they vary from brunette to translucent black. The principal language of the upper classes is the Amharic, closely allied to the ancient Geez (still used in ritual), and is written in a syllabary resembling that of the old inscriptions in Yemen, Arabia. The Amharic is the language of the court. (See AMHARIC LANGUAGE.) Of the same stock are the Tigré and Tigrinya tongues. The language of the common people throughout a great part of the country is the Agao, or Agau, a Hamitic tongue. The Gallas, who form an important element in the population, likewise speak a Hamitic language. The Abyssinians are in the hand epoch of the iron age. Polygamy prevails extensively. They have little that deserves the name of literature. Education is in the hands of the clergy. The national religion is a perverted Christianity, introduced into the country in the fourth century. The tribe of the Falashas profess Judaism. The Gallas are Mohammedans.

History. Approximately the northern half of modern Abyssinia is a part of the ancient and vaguely defined Ethiopia. (For its ancient history, see the article on ETHIOPIA.) The people still call themselves Ethiopians, the name Abyssinians, by which they are generally known outside their own borders, being a Portuguese form of the Arabic *Habsh* or *Habesh*, signifying 'mixture,' and referring to the diverse tribes which compose the population. The traditions, customs, and language point to an early and intimate intercourse with the Jews; and the Book of Kings professes to record the rulers down from the Queen of Sheba and her son Menelek by Solomon, King of Israel; but this book is not to be depended upon unless corroborated by independent evidence. Greek influence was introduced through an invasion by Ptolemy Euergetes (247-221 B.C.). In the fourth century Christianity was introduced, and Frumentius, who had been instrumental in its introduction, was consecrated as a bishop by Athanasius, patriarch of Alexandria, about 341, and became, as Abuna Salamah ('our father of peace'), the head of the Abyssinian church, with his seat at

Axum, then the capital. The Coptic rite, older than that of Rome or Moscow, has prevailed in Abyssinia to the present day, in spite of efforts to introduce other forms of Christianity made by the Jesuits in the sixteenth century and by representatives of Protestant churches in later years. The head of the church is still the abuna, who is sent from Alexandria; but he shares his ecclesiastical authority with the native Echegeheh, or head of the monastic bodies. Monasticism of the Oriental type was introduced about the year 470, and became a permanent feature of the life of the country. The monks number about 12,000. In the sixth century the King of the Homerites, an Arab convert to Judaism, began a persecution of the Christians, and King Elesbaas, or Caleb of Axum, invaded Arabia, and conquered Yemen, which was ruled as a province of Abyssinia for 67 years.

This was the most flourishing period of Abyssinia; its influence then reached farthest and it was most in touch with the outside world. In 590 the overthrow of Abrahah, the last Abyssinian ruler of Yemen, left Arabia open for the spread of Mohammedanism, which soon isolated Abyssinia from the outside world and from the influences that had been urging it forward. Its civilization was thus left in a primitive, half-barbarous condition. A line of usurpers took the place of the ancient sovereigns in the tenth century and reigned until about 1300. In the reign of Naakweto Laab, the last of this line, Tekla Haimanot, an ardent patriot, who possessed great influence because of the dignity of his character and the unselfishness of his life, succeeded in negotiating a treaty between the King and the representative of the old line, which still held the government of Shoa, by which Naakweto Laab agreed to abdicate, receiving in return a certain mountainous province as a hereditary possession and the right of sitting on the same kind of chair as that used by the sovereign. By the same treaty one-third of the kingdom was granted to the clergy, and it was provided that no native should ever be abuna, but that the office should be filled by appointees of the Patriarch of Alexandria. This was an attempt to renew some connection with the outer world and shows that the more intelligent Abyssinians keenly felt their isolation. The rise of the Mohammedan power cut Abyssinia off from the coast; the invasion of the rude Gallas from the south in the sixteenth century introduced an alien race into the country, which has always been a disturbing element. The true Abyssinian type was produced probably by a mingling of the African Hamitic and the Asiatic Semitic stocks, which here came into contact.

Portuguese Jesuit missionaries came into the country in the sixteenth and seventeenth centuries, and Portugal took much interest in Abyssinian affairs, assisting the negus against his enemies, the Turks. The attempt of the Jesuits to supplant the old faith with that of Rome was intensely displeasing to the Abyssinians, who have always clung loyally to their national church. The Jesuits were expelled in 1633, and Abyssinia relapsed again into practical isolation until the nineteenth century. Occasional African explorers entered Abyssinia from the fifteenth to the nineteenth century (see BRUCE, JAMES), and some remained, voluntarily or constrained by the laws of the country, which at times were hospitable to the admission of

travelers, but did not allow their departure. In the middle of the nineteenth century the power was in the hands of Ali, a *ras* or prince of the barbarous Gallas, when it was seized by Lij ('Mr.') Kasa, an adventurer who was crowned as negus with the name of Theodore in 1854. He was at first very friendly to the English, and acted to a great extent under the advice of the English consul, Mr. Plowden; but meeting difficulties in his task of imposing unity upon the disorganized country, he became morose, and taking offense at the neglect by the British government of a letter sent by him to Queen Victoria, he imprisoned Mr. Cameron, then British consul, and his suite, and followed this by seizing and holding the members of the mission sent by the British government under Mr. Rassam to negotiate for freeing the consul. After prolonged and useless attempts at negotiation, an army of English and Indian troops, under Sir Robert Napier, invaded the country and, in a vigorous campaign, captured Magdala, Theodore's chief stronghold, and released the prisoners (April 13, 1868). Theodore at once committed suicide. He was succeeded by John, *ras* of Tigré, who proved unequal to the task of quelling rebellion. He fell in 1889 in battle with the dervishes of the Sudan, his body was captured, his head was cut off and raised on a spear and with the heads of his generals and ministers was sent to the Kalifa. Menelek II, *ras* of Shoa, who claims to represent the old line of kings, obtained the crown.

Italy, eager for lands, began to look in this direction as early as 1870 and, having occupied several hundred miles of the Red Sea littoral about Massawa (1881-85), commenced aggressions upon Abyssinian territory, which would have resulted in open war but for the intervention of England, through the friendly mission of Sir Gerald Portal. The Italians claimed a protectorate over Abyssinia by virtue of a clause in the treaty of Uchali (1889), which read differently in the Amharic and Italian versions. Menelek denounced this treaty in 1893, and when the Italians occupied Kassala in the following year, as an outcome of the Anglo-Italian agreement of 1891, defining the spheres of influence of the two nations, Abyssinia renewed hostilities (1895). After sustaining a terrible defeat at Adowa, March 1, 1896, Italy was compelled, in the treaty of Addis Abeba (Oct. 26, 1896), to recognize fully the independence of Abyssinia. In 1897 Great Britain ceded a portion of Somaliland to the Abyssinian government, and in the following year the equatorial province of Kaffa was erected. The boundary towards Eritrea on the north and northeast was fixed by agreement with Italy in 1900, 1902, and 1908, and in May of the latter year the boundary between Abyssinia and the Sudan, down to about 6° north latitude, was regulated by agreement with Great Britain, the Emperor agreeing at the same time to permit the construction of a railway through his territories connecting the Sudan and Uganda, a valuable concession in view of the difficulties that would be connected with an attempt to carry the Cape-to-Cairo Railway through the swamp lands of the Upper Nile. A treaty of commerce was concluded with the United States in December, 1903 (negotiated by Robert P. Skinner, U. S. Consul at Marseilles), and with Germany in March, 1905. In order to end the rivalry between claimants to the succession, Menelek in 1908 proclaimed as

ACACIA, ETC.



1. ALOE (*Aloe vera*).
2. ACONITE (*Aconitum napellus*).

3. ACACIA (*Acacia arabica*; var. *nilotica*).
4. ARNICA (*Arnica montana*).

his heir his grandson, Lij Yasu (born 1897), who soon thereafter, on account of the Emperor's illness, assumed direction of the government.

Consult: Wylde, *Modern Abyssinia* (London, 1891); Vivian, *Abyssinia* (New York, 1901); Portal, *My Mission to Abyssinia* (London, 1892); Rassam, *Narrative of the British Mission to Abyssinia* (London, 1869); Markham, *A History of the Abyssinian Expedition* (London, 1869), containing an excellent summary of Abyssinian history; Vignéras, *Une mission française en Abyssinie* (Paris, 1897); Rohlf's, *Meine Mission nach Abyssinien* (Leipzig, 1883); Stanford's *Compendium of Geography and Travel*, vol. i (London, 1899); J. T. Bent, *The Sacred City of the Ethiopians* (London, 1893); Welby, *Twixt Sirdar and Menelck* (London, 1901); "Consul Skinner's Mission to Abyssinia" in *National Geographical Magazine*, vol. xv (1904); Morié, *Histoire de l'Ethiopie* (Paris, 1904). See AFRICA, *History*; ITALY.

AB'YSSIN'IAN CHURCH, THE. The church founded about the middle of the fourth century by Frumentius (q.v.), whose titles Abuna ('our father') and Abba Salamah ('father of peace') are still used by his successors. The abuna, the head of the church, is never an Abyssinian, and is appointed by the Coptic patriarch of Alexandria, now resident at Cairo. He is bishop of Axum. In Christology the church is separated into three divisions, one of which is monophysite, while the others hold that Christ's divinity was a special gift of God to the man Jesus. The secular priests are allowed to marry once; circumcision, the Sabbath, and the Levirate law are adhered to. Baptism (of adults by trine immersion, infants by aspersion) and the Eucharist (in which grape juice is exclusively used) are accepted; but confirmation, transubstantiation, extreme unction, purgatory, crucifixes, and image worship are all forbidden. There are 180 festivals and 200 fast days. The Scriptures are read in Geez or Ethiopic, which is now a dead language. The church contains a very large amount of pagan survivals, in the cult of spirits and of the dead, and in magical practices. Its Christianity is perhaps the most corrupt of that of any existing church. See the *Publications of the Princeton Expedition to Abyssinia*, edited by Enno Littmann (Leyden, 1910); Dowling, *The Abyssinian Church* (London, 1909).

ABYSSINIAN MEAD'OW GRASS. See MEADOW GRASS.

ACACIA, à-kā'shà (literally, thorny, Gk. *ákis*, *akis*, point, splinter, thorn). A genus of plants of the family Leguminosæ, by some referred to the family Mimosaceæ, differing from Mimosa in the greater number of stamens (10 to 200) and the absence of transverse partitions in the pods. There are about 450 species of acacia, 300 of which are indigenous to Australia and Polynesia. The others are found in all tropical and sub-tropical countries except Europe. The flowers are small and are arranged in globular or elongated clusters. The leaves are usually bipinnately compound; but in many of the Australian species the leaflets are greatly reduced and the leaf blades correspondingly enlarged and flattened into what are termed phyllodia. Most of the species having phyllodia inhabit hot, arid regions, and this modification prevents too rapid evaporation of moisture from the leaves. Many of the species are of great economic importance; some yield gums, others valuable timber, and

still others food products. The African species, *Acacia gummifera*, *Acacia seyal*, *Acacia ehrenbergiana*, *Acacia tortilis*, and *Acacia arabica*, yield gum arabic, as do the Asiatic species, *Acacia arabica* and the related *Albizzia lebbek*. A somewhat similar gum is produced by *Acacia decurrens* and *Acacia dealbata* of Australia and *Acacia horrida* of South Africa. Gum senegal is the product of *Acacia verec*, sometimes called *Acacia senegal*. The drug "catechu" is prepared from *Acacia catechu*. The astringent bark of a number of species is extensively used in tanning, especially the bark of those known in Australia as wattles. For this purpose *Acacia decurrens*, the black wattle, is one of the best, the air-dried bark of this plant containing about four times as much tanning extract as good oak bark. The cooba (*Acacia saligna*) is another of the important wattle trees. The most valuable timber tree of the genus is probably the blackwood (*Acacia melanoxylon*) of Australia. The tree attains a large size, and the wood is easily worked and takes a high polish. The koa (*Acacia koa*) is one of the important timber trees of Hawaii and is highly prized for cabinet work. A number of the acacias have been introduced into cultivation in Europe and America, where they thrive. The California experiment station recommends planting several species for tanning extract and for timber. A number of species are grown in mild climates and in greenhouses as ornamentals, partly because of the fragrance of their flowers. The common American Robinia or locust (*Robinia pseudacacia*) and the *Robinia hispida* are known as acacia and rose acacia in Europe and elsewhere. Fossil forms of acacia are abundant in the Tertiary beds of Aix in France, and an allied genus, *Acaciæphyllum*, has been described from the cretaceous beds of North America. Consult: F. von Mueller, *Iconography of Australian Acacias* (Melbourne); L. H. Bailey, *Cyclopædia of American Horticulture* (New York, 1900-01); G. Nicholson, *Illustrated Dictionary of Gardening* (London, 1884-89).

ACACIANS, à-kā'shī-anz or à-ka'shanz. See ACACIUS.

ACACIUS, à-kā'shī-ūs, Bishop of Cæsarea (340-365). He founded a sect, named after him, which maintained that the Son was like the Father; not of the same or of similar substance, but that this likeness was in the will alone. Thus he differed from the general Arian party. His doctrine was actually accepted by a synod at Constantinople, which he manipulated (359), which gave rise to Jerome's famous saying: "The whole world groaned and wondered to find itself Arian." Yet in the end, as formerly, it was condemned, and he was exiled. See Gwatkin, *Studies in Arianism* (Cambridge, 1900).

AC'ADE'MIA (Gk. 'Ακαδήμεια or 'Ακαδημία, *Akadēmia*). See ACADEMUS.

AC'ADEM'IC LE'GION. A name applied particularly to an armed body of students who participated in the uprising of 1848 in Vienna; also more generally to similar student companies elsewhere in the revolutionary disturbances of that year.

ACADEMIE DES BEAUX ARTS, à'kà'dà'mé' dâ bō'zär'. See ECOLE DES BEAUX ARTS.

AC'ADE'MUS (Gk. 'Ακάδημος, *Akadēmos*). A mythical hero of Attica. When the Tyndaridæ invaded the Attic land to rescue Helen (q.v.) from the hands of Theseus, Academus revealed to them the place where their sister was hidden.

In return for this act the Lacedæmonians then and thereafter showed the hero great honor. The Academia was thought to have received its name from Academus, though the earlier form of its name, Hecademia, seems to point to an original Hecademus. The Academia was in early times a sacred precinct of Athena, 6 stades northwest of the Dipylon gate of Athens (q.v.), itself on the northwest side of the city. Later, a gymnasium was built in the precinct, and still later the spot was made a public park, being planted with many kinds of trees, adorned with statues, watered by the Cephissus, and laid out in walks and lawns. Here, in the gymnasium and the neighboring walks, Plato conversed with his pupils and held his first formal lectures in philosophy. Later, having purchased in the neighborhood a piece of land and built thereon a temple to the Muses and a lecture hall, he transferred his school thither. This spot was also called Academia and gave its name to Plato's school. See ACADEMY.

ACAD'EMY (Gk. *ἀκαδήμεια*, *akadēmeia*, or *ἀκαδημία*, *akadēmia*). Originally the name of a public garden outside of Athens, dedicated to Athene and other deities and containing a grove and a gymnasium. It was popularly believed to have derived its name from its early owner, a certain Academus, an eponymous hero of the Trojan War. It was in these gardens that Plato met and taught his followers, and from their place of meeting his school came to be known as the Academy. The later schools of philosophy which developed from the teachings of Plato down to the time of Cicero were also known as academies. Cicero himself and many of the best authorities following him reckoned but two Academies—the Old, founded by Plato (428–348 B.C.), and including Speusippus, Xenocrates of Chalcedon, Polemo, Crates, and Crantor; and the New,—founded by Arcesilaus (241 or 240 B.C.). Others have, however, reckoned the latter as the Middle Academy and added a third, the New Academy, founded by Carneades (214–129? B.C.). Others again have counted no fewer than five, adding to the three just mentioned a fourth—that of Philo, and a fifth—that of Antiochus. (See PLATO; ARCESILAUS; CARNEADES; PHILOSOPHY; and references under the last.) From its use in the sense of a school the word “academy” has come to be applied to certain kinds of institutions of learning; from its use in the sense of a body of learned men it has come to be applied to various associations of scholars, artists, literary men, and scientists organized for the promotion of general or special intellectual or artistic interests. Not only was the name applied particularly to the followers of Plato, but it soon came to be given also to general societies of learned men unconnected with a philosophical school. In the Middle Ages the name and institution survived not merely among the Arabs, particularly in Spain, but, passing over the fable of Alfred's foundation of an academy at Oxford, we find such an institution under the name of academy among the group of scholars whom Charlemagne gathered around him.

At the Renaissance the academy sprang into sudden prominence as a favorite form of intellectual organization, taking its place as an intellectual force beside the universities. From these it differed, however, as it still does, in being not a teaching body but a group of investigators, who, generally under royal or state patronage,

encouraged learning, literature, and art by research and publication. Laying aside the claims of Alost to a society of scholars in 1107 and that of Diest to a society of poets in 1302, academies of this type seem to have first appeared in Italy and to have been devoted to literature, art, and architecture. The Academy of Fine Arts, founded at Florence about 1270 by Brunetto Latini; that of Palermo, about 1300, by Frederick II; and the Academy of Architecture of Milan (1380?), were among the first of these. Language and literature were not far behind. The so-called Academy of Floral Games (*Académie des Jeux Floraux*), founded at Toulouse about 1325 by one Clemens Isaurus as a part of the great Troubadour movement, was probably the earliest of these literary academies and has had an almost continuous history till the present day. With this exception the earliest academies rose in Italy, and found their prototype in that brilliant group of scholars, critics, and *literati* gathered at the court of Lorenzo de' Medici, the Magnificent, and Cosmo de' Medici in Florence, the so-called Platonic Academy which, founded about 1474, was dissolved in 1521. It was succeeded in Florence by the Academy of Florence, formed in 1540 especially for the study of Tuscan, particularly Petrarch. Before the Platonic Academy of the Medici only Naples boasts an earlier academy—that founded by Alfonso V about 1440. But the sixteenth century was rich in academies devoted to literature. The *Intronati* of Siena, 1525; the *Infiammati* of Padua, 1534; the *Rozzi* of Siena, later suppressed by Cosmo de' Medici, 1568; and the *Accademia della Crusca* or *Furfuratum*, founded at Florence in 1582 and still in existence, the most famous of them all, are perhaps the best known of that astonishing burst of academic vigor which produced in the sixteenth century in Italy a number variously estimated from 170 to 700 of this form of organization. In these, under curious names but with a common purpose, the Italian aristocracy especially, barred from political interests by tyrants and republics alike, found vent for their activity.

One academy of distinction alone devoted to science appears in this period, the *Accademia Secretorum Naturæ*, founded at Naples in 1560, but after a short existence suppressed by the Church. It was succeeded by the *Accademia de' Lincei*, founded by Prince Chesi in 1603, counting Galileo among its members and still existing in Rome after many changes. The foundation of this society heralded that great burst of interest in sciences of the seventeenth and eighteenth centuries which to some extent replaced the purely literary activity of the sixteenth. The Reformation had destroyed or altered much of the ecclesiastical power which had served to check investigation earlier, and the foundation of several societies indicated a new interest in science. Of these the *Accademia Naturæ Curiosorum*, Leipzig, established by Dr. J. L. Bausch in 1651–52, still exists under the name of *Cæsareo-Leopoldinia*, in honor of the Emperor Leopold I, who patronized it liberally. Since 1808 it has had its headquarters at Bonn. The Royal Society (q.v.) in England, the Academy of Sciences in Paris, the Academy or *Collegium Curiosum* established by Professor Sturm of the University of Altdorf, and similar institutions brought about an astonishing increase of interest and consequent advance in scientific pursuits and methods. Indeed the importance

of these academies to science can hardly be over-estimated.

This was maintained in the eighteenth century, when the establishment of academies was further stimulated by the influence of Louis XIV, as important in this as in so many other intellectual and political interests throughout Europe. In this, however, as in so many other ways, he and his ministers but carried further the plans of their predecessors. In 1635 Richelieu established the most famous of all such organizations, the old French Academy, which had its inception six years before in the minds of eight men of letters. It consisted of 40 members, with a director, a chancellor, and a secretary, and its avowed purpose was to control the French language and regulate literary taste. Its constitution provided for the publication of a grammar, a treatise on rhetoric, and one on poetry, besides a dictionary of the French language. Though its condition has been somewhat changed, it is the same in all essentials to-day as it was at its foundation. In this plan Richelieu was copied, as usual, by his successor, Mazarin, who established the Academy of Painting and Sculpture (the present Academy of Fine Arts) in 1648. It was opened in 1664 by Colbert, who in 1671 founded the Academy of Architecture, later merged into the Academy of Fine Arts. Colbert founded also the Academy of Inscriptions and Belles Lettres in 1663, as a committee of the old academy to draw up inscriptions for monuments and medals to commemorate the victories and glories of Louis XIV, the Academy of Sciences and the Academy of France at Rome in 1666. The Academy of Inscriptions was remodeled in 1706. All these, save the last, together with the Academy of Moral and Political Science, founded in 1832, came to form the Institute of France (q.v.). To Louis XIV other cities in France, notably Montpellier in 1706, owed the charters of their academies.

Owing largely to these two causes, that is to say, the interest in science and the fashion of royal patronage set by Louis XIV, the foundation of academies reached its height in the eighteenth century, especially in Germany and the north and east of Europe. Frederick I of Prussia founded the Royal Academy of Sciences in Berlin in 1700 on a plan drawn up by Leibnitz, its first president. That savant, too (together with Wolff, his great German contemporary), aided in drawing up the scheme adopted by Peter the Great and carried out by Catharine I in the foundation of the Imperial Academy of Sciences at St. Petersburg in 1725. In 1739 the Academy of Sciences of Stockholm was established, with Linnæus as a most distinguished member, and was incorporated in 1741 as the Royal Swedish Academy. In 1742 Christian VI founded the Royal Academy of Copenhagen. In 1750-51 the Göttingen Academy of Sciences was established; in 1754 came the Electoral Academy at Erfurt; in 1755 the Academy of Sciences of Mannheim was founded by the Elector Palatine, Karl Theodor, and in 1759 the Electoral Bavarian Academy of Sciences was founded at Munich. In Italy the Royal Academy of Sciences of Turin originated in 1757 as a private society, receiving royal recognition in 1783. Not merely were academies founded in the broad field of science, embracing in its earlier sense all human knowledge, but they were established for all imaginable special purposes. In surgery the

Surgical Academy of Paris, 1731, and the so-called Academy of Surgery at Vienna, 1784, more properly a college, are the most prominent examples. In archæology and history we find the Royal Academy of History established at Madrid in 1738, the Archæological Academy of Upsala founded in 1710, that of Cortona in 1727, and that of Herculaneum at Naples in 1755. In literature the Royal Spanish Academy, founded by the exertions of the Duke d'Escalona in 1713 or 1714, and the Royal Academy of Savoy, founded by Charles Felix in 1719, are the most prominent of numerous similar institutions, including those of St. Petersburg of 1783 (later a part of the Imperial Academy) and Stockholm in 1786. In music and the fine arts, the departments to which the name has been especially applied in England, the Royal Academy of Arts was founded in 1768, with Sir Joshua Reynolds as its first president, the Academy of Arts at Milan, that of painting and sculpture and architecture at Madrid by Philip V, the Swedish Academy of Fine Arts by Count Tessin in 1733, and the Academy of Painting and Sculpture at Turin in 1778.

During the nineteenth century a smaller number of such organizations were founded, partly because the field was already well covered, partly because other forms of activity or the same form of institution under a different name took their place. (See SOCIETIES; ADVANCEMENT OF SCIENCE, ASSOCIATIONS FOR THE.) The Royal Hibernian Academy, founded in 1803, the English Royal Academy of Music, founded in 1822 and incorporated in 1830, and the Royal Scottish Academy, founded in 1826 and chartered in 1838, represent the English activities in this field. The Philadelphia Academy of Sciences, founded in 1812 and incorporated in 1817, and the Vienna Academy of Sciences, founded in 1846, are among the most important scientific foundations of the last century. The Celtic Academy of Paris, founded 1800 to 1805 and merged in 1813 into the Society of Antiquaries of France, and the Academy of History and Antiquities of Naples, founded by Joseph Bonaparte, represent the Napoleonic period. The Academy of Medicine of Paris, founded in 1820 for research into matters affecting public health, has rendered excellent service to the community generally. But the most important event in academic organization of that century was the reorganization of the French Academy into the Institute of France (q.v.). The French Academy, as now constituted, represents the old academy of Richelieu, though it is reckoned officially as the highest of the five divisions of the Institute. Its membership in 1914 was as follows, in order of seniority:

Alfred Mézières	Alexandre Ribot
Comte Othénin d'Haussonville	Maurice Barrès
Charles de Freycinet	Maurice Donnay
Julien Viaud (Pierre Loti)	M ^{is} de Ségur
Ernest Lavisse	Francis Charmes
Paul Bourget	Jean Richepin
Jules Lemaître	Raymond Poincaré
Anatole France	Eugène Brioux
Comte Albert de Mun	Jean Aicard
Gabriel Hanotaux	René Doumic
H. E. L. Lavedan	Marcel Prévost
P. E. L. Deschanel	Mgr. L. Duchesne
Paul Hervieu	Henri de Regnier
Emile Faguet	Henry Roujon
Marquis C. J. Melchior de Vogüé	H. R. D. Cochin
Edmond Rostand	Hubert Lyautey
Frédéric Masson	Emile Boutroux
René Bazin	Henri Bergson
Etienne Lamy	Alfred Vincent Capus
	Pierre de la Gorce

It remains to notice in detail some of the other more important existing academies. The Royal Academy, Burlington House, London, the association of English artists, founded in 1768, holds an exhibition each year open to all artists of distinction and corresponding to the French Salon. It consisted in 1912 of 40 Academicians (R.A.) and 30 Associates (A.R.A.), the prescribed number. Sir Edward John Poynter has been its president since 1896. In 1902 the British Academy for the promotion of historical, philosophical, and philological studies was founded at London. Its maximum membership is 100, and it is divided into four sections—history and archæology, philology, philosophy, jurisprudence and economics. The Royal Academy of Sciences at Berlin, founded under another name by Frederick I in 1700, owes its present statutes to the year 1881. It consists of two sections—physics-mathematics and philosophy-history. It has 67 regular, 20 foreign, 200 corresponding, and a number of honorary members. Its publications have appeared since its foundation. The Imperial Academy of St. Petersburg, founded in 1725, has three divisions—physics-mathematics, Russian language and literature, history-philology. It is richly endowed and offers yearly prizes for contributions to learning. It has a very large library and controls a number of museums. The Royal Swedish Academy of Sciences, founded in 1739 and incorporated under its present name five years later, has 100 native and 75 foreign members, and its work is divided into nine classes. The Royal Bavarian Academy includes theology, law, finance, and medicine among its activities, and has three classes—philosophy-philology, mathematics-physics, and history. The Imperial Academy of Sciences of Vienna, founded in 1847, comprises two classes—philosophy-history and mathematics-science—with frequent meetings and especially numerous and important publications. It is well endowed by private and State benefaction and is enabled to send out many scientific expeditions. The Kaiser Wilhelm Society for the Promotion of Science, founded by Kaiser Wilhelm II at Berlin in 1911, is the newest addition to the long list of scientific societies having governmental sanction and support.

In the United States there are fewer such societies. The earliest founded was the American Philosophical Society, organized in 1743 through the efforts of Benjamin Franklin, who was its first secretary and later, until his death, its president. The interests and the activities of this society covered the whole range of pure and applied science and of philosophy. The publication of its *Transactions* began in 1771 and of its *Proceedings* in 1838. At present the society has 200 resident and 300 non-resident members. The American Academy of Arts and Sciences was chartered by the Legislature of Massachusetts in 1780, largely through the influence of John Adams. Its attention was devoted to the study of the antiquities and the natural history of America. It has published a series of memoirs since 1785 and *Proceedings* since 1846. The Connecticut Academy of Arts and Sciences was founded in 1799 and the Philadelphia Academy of Natural Science in 1812. The latter has a very valuable library and museum, especially rich in conchology and ornithology, and has published *Journals* since 1817 and *Proceedings* since 1841, besides the *American Journal of Conchology*. The New York Academy of Science was

founded in 1818 as the Lyceum of Natural History, receiving its present title in 1875. It is organized into the following four sections: Astronomy and physics, geology and mineralogy, biology and anthropology, psychology and philology. These sections hold monthly meetings, while the Academy holds general meetings and gives an annual exhibit of scientific progress that is of great value. Similar scientific academies have been organized in most of the large cities in the United States, but their influence is chiefly local. Such societies usually cover the entire field of the exact and the natural sciences, while special societies for particular sciences are now commonly formed. In recent years Washington has become the centre of scientific interest in this country. In 1898 its various scientific societies combined into the Washington Academy of Science. Other national scientific associations have been formed. In 1863 Congress chartered the National Academy of Sciences, which was designed to investigate scientific questions and to report thereon to the government. As a matter of fact, however, the Academy has not been frequently employed by the government. It holds two meetings annually and issues reports and memoirs. The membership of the Academy originally was limited to 50 members, but in 1870 this limitation was removed. In 1907 its resident membership was limited to 150, not more than 10 to be elected in a single year, and the number of foreign associates to 50. In 1912 the Academy had 124 regular and 42 associate members. The American Association for the Advancement of Science was organized in 1848 and is the most active and the largest of such associations. It now has 8100 members. In fine arts both Philadelphia and New York possess institutions under the name of academies, founded in 1805 and 1828 respectively, having schools of design and annual exhibitions. Many other such associations, under various names, exist in this country for the promotion of research and publication along literary and scientific lines. Of these the American Academy of Political and Social Science, of Philadelphia, is perhaps the most important. It was founded in 1889 and incorporated in 1891. It has a membership of over 6100, and its publications, under the title of *Annals*, are of unusual importance. See SMITHSONIAN INSTITUTION.

In the sense of a school or an institution of learning, the term "academy" has come to be applied particularly in the eastern part of the United States, to an educational institution ranking between the elementary school and the college. But the term is occasionally used elsewhere. John Milton, for instance, in his *Tractate on Education*, calls his ideal educational institution an academy. In England the term is applied to those institutions of secondary rank established by the dissenting religious bodies during the latter part of the seventeenth and in the eighteenth centuries to provide for the general education of their youth, especially those intended for the ministry, since such education could not be obtained in the existing public schools. In the United States the term was first applied to the institution founded in Philadelphia in 1749 under the leadership of Benjamin Franklin. This Academy and College of Philadelphia was chartered in 1753 and in 1779 became the University of Pennsylvania. The typical academies were those founded during the Revolutionary War period at Exeter, N. H., and

Andover, Mass., largely through the generosity of John Phillips, after whom they are named. Such academies became very numerous and took the place of the old Latin grammar schools, which had lost their popularity and serviceableness on account of the economic and political changes of the eighteenth century. They are controlled by trustees, usually of some one religious denomination, and are not dependent upon state support. Their place has been largely taken up by the modern high school; such as still exist have for the most part become college preparatory schools.

The term is also used much more widely in a looser sense, to indicate places where special accomplishments such as riding, dancing, or fencing are taught. A more restricted use is that in connection with schools preparing for particular professions, as the United States Military Academy at West Point. In France and the United States it is occasionally applied also to buildings devoted to particular arts, especially music (hence an opera house is often called an academy of music), and occasionally, by analogy, even to theatres.

Consult: D. M. Robertson, *The French Academy* (New York, 1910); *Minerva*; *Official Year-Book of Scientific and Learned Societies of Great Britain and Ireland*; *Whitaker's Almanack*; *Almanach National*; Steeves, *Learned Societies and English Literary Scholarship in Great Britain and the United States* (New York, 1913); Ornstrin, *The Rôle of the Scientific Societies in the Seventeenth Century* (New York, 1913); Mahaffy, J. P., "On the Origin of Learned Academies in Modern Europe" (Royal Irish Academy, *Proceedings*, Dublin, 1913, vol. xxx, Sec. C, pp. 429-444).

ACADEMY OF ARTS AND LETTERS, AMERICAN. A body founded in 1898 by the action of the American Social Science Association, which, at its annual meeting in that year, nominated a small group of authors and artists to constitute a National Institute of Arts and Letters. The qualification for membership in this body was to be a notable achievement in art, music, or literature. The membership was at first limited to 150, but was afterwards increased to 250. When the institute had included in its membership a large proportion of the most notable artists and writers of the United States, it proceeded to organize an Academy of Arts and Letters, the members of which should be chosen from the membership of the Institute. In 1904 the first seven members were chosen, and provision was made for the progressive responsibility of the choice of those elected later. The first seven were William Dean Howells, Augustus Saint Gaudens, Edmund Clarence Stedman, John La Farge, Samuel Langhorne Clemens, John Hay, and Edward A. MacDowell. These were empowered to elect more members, and the 15 thus chosen five more. This method of election continued until the entire membership of 50 was completed.

The constitution of the Academy declares that its aim is to further and represent the interests of fine arts and literature. In 1909 was held the first of a series of public meetings to be held annually in different cities.

The living members of the Academy in 1913 were as follows:

William Dean Howells
Henry James
Henry Adams
Thomas Raynesford Lounsbury

Theodore Roosevelt
John Singer Sargent
Alfred Thayer Mahan
Daniel Chester French

John Burroughs
James Ford Rhodes
Horatio William Parker
William Milligan Sloane
Robert Underwood Johnson
George Washington Cable
Andrew Dickson White
Henry van Dyke
William Crary Brownell
Basil Lanneau Gildersleeve
Woodrow Wilson
Arthur Twining Hadley
Henry Cabot Lodge
Francis Hopkinson Smith
Edwin Howland Blashfield
William Merritt Chase
Thomas Hastings
Hamilton Wright Mabie
Brander Matthews
Thomas Nelson Page

Elihu Vedder
George Edward Woodberry
Kenyon Cox
George Whitefield Chadwick
Abbott Handerson Thayer
John Muir
Charles Francis Adams
Henry Mills Alden
George deForest Brush
William Rutherford Mead
John W. Alexander
Bliss Perry
Abbott Lawrence Lowell
James Whitcomb Riley
Nicholas Murray Butler
Paul Wayland Bartlett
George Brown Post
Owen Wister
Herbert Adams
Augustus Thomas

The following, now deceased, were members of the American Academy of Arts and Letters: Augustus Saint Gaudens, Edmund Clarence Stedman, John La Farge, Samuel L. Clemens, John Hay, Edward MacDowell, Charles Follen McKim, Charles Eliot Norton, John Quincy Adams Ward, Thomas Bailey Aldrich, Joseph Jefferson, Richard Watson Gilder, Winslow Homer, Carl Schurz, Joel Chandler Harris, Daniel Coit Gilman, Donald Grant Mitchell, Julia Ward Howe, Francis Marion Crawford, Henry Charles Lea, Bronson Howard, Edwin Austin Abbey, Thomas Wentworth Higginson, William Vaughn Moody, Frank Davis Millet, Horace Howard Furness, John Bigelow, and Edward Everett Hale.

Two vacancies existed. The officers were William Dean Howells, president; William Milligan Sloane, chancellor; Robert Underwood Johnson, permanent secretary.

ACAD'EMY OF DESIGN', NATIONAL. See NATIONAL ACADEMY OF DESIGN.

ACA'DIA (Fr. *Acadie*, *L'Acadie*, or *La Cadie*, from the Micmac Indian word *ākāde*, abundance). See NOVA SCOTIA.

ACA'DIAN SE'RIES. See CAMBRIAN SYSTEM.

ACAJUTLA, ä'ká-hōōt'lá. A seaport in the department of Sansonate, Republic of Salvador, Central America, situated on the Pacific Ocean, 10 miles south of Sansonate and about 1000 miles from Panama (Map: Central America, C 4). It is the second port of Salvador in importance and is the outlet for most of the coffee and sugar export trade of Santa Ana. It is the seat of a consular agent of the United States.

ACALEPHÆ, äk'ä-lē'fē (pl. of Gk. *ἀκαλήφη*, *akalēphē*, a nettle, a kind of jellyfish). A group of free-swimming, discoidal, or bell-shaped medusæ, the lobed jellyfishes, with downwardly directed mouth, gastro-vascular pouches, and numerous radial canals, and having, as a rule, the margin of the umbrella lobed; called Discophora by Huxley. See JELLYFISH.

AC'ANTHA'CEÆ (for derivation see ACANTHUS). A family of dicotyledonous plants embracing about 130 genera and 1600 species. It is found chiefly in the tropics, but also occurs in the south of Europe and the United States. The species are mostly herbs and shrubs, although a few become trees. Plants of this family frequent almost every situation, from marshes to the driest of conditions where plants are able to survive. The leaves are usually thin and entire, the flower parts in fours or fives, stamens often two, and styles two. The fruit is a two-celled capsule, upon the explosion of which the seeds are thrown out, aided by peculiar outgrowths from the base of their stalks. The chief genera are *Nelsonia*, *Thunbergia*, *Strobilanthus*, *Ruellia*, *Blepharis*, *Acanthus*, and *Justicia*.

ACANTHITE (Gk. *ἀκανθα*, *akantha*, thorn). A silver sulphide that crystallizes in the orthorhombic system. It is iron-black in color and has a metallic lustre. It occurs with argentite and stephanite at various localities

near Freiberg in Saxony and is named from the peculiar shape of its crystals.

ACAN'THOCEPH'ALA (Gk. *ἄκανθα*, *akantha*, thorn, prickle + *κεφαλή*, *kephalē*, head). A class of parasitic roundworms belonging to the phylum *Nemathelminthes* and distinguished by an elongated cylindrical body and a proboscis armed with horny hooks. The class contains three families, viz., Gigantorhynchidæ, Neorhynchidæ, and Echinorhynchidæ. (*Echinorhynchus*) *Gigantorhynchus gigas* is parasitic in the small intestine of swine, and is said to be common in man along the banks of the Volga. Other species are found in ducks, aquatic birds, fish, etc.

ACANTHOPTERYGII, *āk'an-thōp-tēr-ij'i-i* (Gk. *ἄκανθα*, *akantha*, thorn + *πτερύγιον*, *pterygion*, wing; pl., fins). One of the primary divisions of the osseous fishes (Teleostei). It includes many families, among which are largely the most specialized forms of fishes. They are characterized by the possession of spines in the anterior portion of the dorsal fin or in the first dorsal when two are present, and by the usual absence of a pneumatic duct connecting the air-bladder with the œsophagus. The ventral fins are generally thoracic, i.e., fastened to the shoulder. The acanthopterygian fishes include the perch, bass, mackerel, and similar forms.

ACAN'THUS (Lat., from Gk. *ἄκανθος*, *akanthos*, bear's breech). A genus that gives name to the family Acanthaceæ, and whose 25 or more species are found in southern Europe, tropical and subtropical Asia, Africa, and Australia. *Acanthus spinosus*, of southern Europe, is the species whose leaf is said to have suggested the ornamentation of the Corinthian column. In cultivation the acanthus is only semi-hardy and needs protection in England and in the United States north of Virginia.

In Architecture. The Greeks early applied the conventionalized *Acanthus spinosus* to decorative use, at first merely to mask the branch-



ACANTHUS.

a. *Acanthus mollis*. b. *Acanthus spinosus*. c. Greek acanthus architectural. d. Roman acanthus architectural. e. Acanthus scroll-nest or cauliculus.

ing of carved anthemion-scrolls, later to form highly decorative nests from which sprang the scrolls and anthemions on carved stele-heads (fourth century); and finally, as upright leaves with a slight outward curl, to decorate the bell of the Corinthian capital. The early examples resemble a thistle or cactus as much as a true acanthus. The Romans adopted the acanthus

and Corinthian capital, and developed both into splendid types which have influenced nearly all subsequent styles. They greatly extended the applications and varied the forms of the acanthus, which in their hands resembles rather the *Acanthus mollis* than the *Acanthus spinosus*. It is thinner, more flexible, and more elaborately detailed than the Greek type, with more strongly accented ribs, "pipes," and "eyes," and with leaflets less acutely pointed. It became in Roman hands a purely conventional type, to whose variations the names "olive," "palm," etc. have been fancifully applied. The Romans of the Empire elaborated the Corinthian capital and the combination of the acanthus with branching scrolls which the French call the *rinseau*; they applied the leaf to countless uses, including the decoration of friezes, pilasters, and moldings, fresco painting, the ornamentation of table feet, of vases, candelabra, furniture, goldsmith work, and embroideries. It naturally passed into post-classical ornament, together with the Corinthian capital, and we find it in early Christian, Byzantine, and Romanesque art. In certain parts of Italy it preserved its purity until the Renaissance—especially in central and southern Italy—and in southern and central France it was superseded only by Gothic foliage, in which its influence is, however, often traceable. It was revived by the artists of the Renaissance, treated with remarkable richness of fancy, and has ever since been one of the most prolific and acceptable of ornament motives. See COLUMN; RINCEAU.

A CAPELLA, *ä kâ-pěl'lâ* (It., in the church style). Music for voices without accompaniment, like the early Church compositions. The term is also used when the accompaniment is octaves or unison. As an indication of time it is equivalent to *alla breve* (q.v.).

A CAPRICCIO, *ä kâ-prêt'chō* (It.). At the caprice or pleasure of the performer, regarding both time and expression. A musical term.

ACAPULCO, *ä'kâ-pōōl'kō* (a corrupted abbreviation of the Latin name [*Portus*] *Acquæ Pulchræ* [Port of], beautiful water). A town on the Pacific coast, in Guerrero, Mexico, 231 miles southwest of the City of Mexico, of which it was formerly the Pacific port, on account of the excellence of its harbor (Map: Mexico, J 9). A remarkable engineering feat, the cut known as the Alera de San Nicolas, forms a passage-way through the nearby mountains. It was the chief centre of commerce with the Philippine Islands, as well as China and India, until the railroad between the City of Mexico and San Blas robbed it of most of its trade. It exports copper, fruit, and hides. Acapulco is 1437 miles from Panama. Pop., 1900, 4932; 1910, 5900.

ACARIASIS, *āk'ä-rī'ä-sīs*. See MANGE.

ACARINA, *āk'ä-rī'nä*. See MITES.

AC'ARNA'NIA (Gk. *Ἀκαρνανία*, *Akarnania*). A mountainous, wooded country of ancient Greece, separated from Epirus on the north by the Ambracian Gulf, now the Gulf of Arta, from Ætolia on the east by the river Acheloiüs, and washed south and west by the outer Corinthian Gulf and the Ionian Sea. Its oldest inhabitants were of Illyrian stock. In the seventh century B.C. the Corinthians established colonies in Acarnania, at Leucas, Anactorium, and Ambracia. Thenceforth the civilization of Acarnania was Dorian in character. In the early years of the Peloponnesian War the Acarnanians sided with Athens; later they fa-

ACANTHUS, ETC.

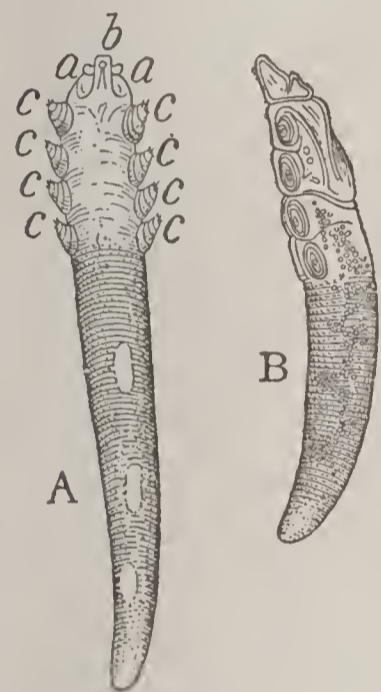


1. ACANTHUS (*Acanthus mollis*, var. *latifolius*).
 2. AFRICAN LILY (*Agapanthus umbellatus*).
 3. LOVE-LIES-BLEEDING (*Amaranthus caudatus*).
 4. ALMOND (*Prunus Persica*).

5. WORMWOOD (*Artemisia Absinthium*).
 6. ROCKY MOUNTAIN ADDER'S TONGUE (*Erythronium grandiflorum*).
 7. PHEASANT'S EYE (*Adonis autumnalis*).

vored the Macedonians. They were naturally hunters and herdsmen and long remained behind the rest of the Greeks in culture. Along with Ætolia, Acarnania now forms one of the nomes or departments of the modern kingdom of Greece, with an area of 3013 square miles and a population of 141,405 in 1907. The western part of Acarnania—from the mouth of the Achelous or Aspropotamo to Cape Actium in the northwest—is occupied by a mass of rocky and thickly wooded mountains, rising abruptly from the indented coast and culminating in the summit of Berganti. A considerable part of Acarnania is overgrown with wood—a rare feature in modern Greece. It has no town of importance, though naturally the territory is not destitute of resources. Consult Oberhammer, *Akarnanien, Ambrakia, Amphilochien, Leukas im Altertum* (Munich, 1887); Swoboda, *Zur Geschichte von Akarnanien* (Klio, Leipzig, 1910, vol. x). See the first ALCMÆON.

AC'ARUS FOLLIC'ULO'RUM, or *Demodex*, or *Steatozoön folliculorum*, the comedo mite. A microscopic parasite residing in the sebaceous glands and hair follicles of the human skin. It



(A) ACARUS FOLLICULORUM.

(B) DEMODEX MORNINIS.

was first described by Dr. Simon of Berlin in 1842. The title *Acarus folliculorum* was suggested by the zoölogist, Erichson of Berlin. According to Professor Owen, who gave it the name of *Demodex*, it represents the lowest form of the class Arachnida, and represents a transitional stage between the Annelids and the higher Articulata. They are met with in almost every person in varying numbers in the skin follicles of the nose, face, and less often in those of the back, breast, and abdomen. They vary in

length from 1/50th to 1/100th of an inch. The accompanying figure represents the magnified parasite. The head is always directed inward. The animal possesses eight rudimentary thoracic appendages (*c, c*) each terminating in three short setæ. The integument of the abdomen is finely annulated. The mouth is suctorial or probosciform, consisting of two small spine-shaped maxillæ (*b*), and an extensive labium capable of being elongated or retracted; it is provided on each side with a short, thick, maxillary palp (*a, a*), consisting of two joints with a narrow, triangular labrum above. The sexes are distinct, but the differences between the male and female are ill defined. Ova are frequently seen in the body of the female or in detached masses. Acari may be examined by collecting between two pieces of thin glass the expressed fatty matter from a follicle and moistening it with a drop of olive oil before placing under a microscope. Identical animals have been found in the skin of dogs, hogs, and cattle. They damage cowhides in some instances. No treatment is requisite since no causative relation exists between them and human skin diseases.

ACASTE, á'kást'. One of the characters in Molière's *Misanthrope* (q.v.); a self-satisfied young marquis who easily consoles himself when scorned as a suitor by Célimène.

ACASTO, á-kás'tò. In Otway's tragedy of *The Orphan* (q.v.), a nobleman retired from the court who is the guardian of Monimia, the heroine, and father of Castalio and Polydore.

ACAS'TUS (Gk. "Ακαστος, *Akastos*). A son of Pelias, King of Iolcus; one of the Argonauts and of the Calydonian hunters. He avenged the murder of his father (killed by his daughters at the instigation of Medea) by driving Jason and Medea out of Iolcus. See ARGONAUTS; JASON; MEDEA.

AC'ATHIS'TUS (Gk. *ἀ*, a priv. + καθίζειν, *kathizein*, to sit down). A hymn in honor of the Virgin, sung standing in the Greek church on Saturday of the fifth week in Lent, when the repulse of the Avars from Constantinople is celebrated.

AC'CAD (Hebrew 'Akkad'). One of the cities in the land of Shinar (q.v.), or Babylonia, mentioned in Gen. x. 10. It is identical with the city of Agade, or Akkad, the capital of Sargon (q.v.) and Naram Sin (q.v.), which was still in existence in the days of Nebuchadnezzar I (c.1130 B.C.). The modern site has not yet been found. Bereshith Rabba, Jerome, and Ephraem placed it at Nisibis. But it is more likely to have been located opposite Sippar (the modern Abu Habba). Among the titles of the kings of Babylonia and Assyria "king of the land of Shumer and Akkad" frequently occurs. It implies rule over all of Babylonia with its Sumerian and Akkadian inhabitants. The Akkadians were the earliest Semitic settlers in Babylonia. As the city of Agade, which may be the earlier Sumerian name, became their first great centre, they became known as Akkadians, and the name Akkad was extended to the northern part of Babylonia, while the south was called Sumer. Ethnically and linguistically they are distinct from the Sumerians who spoke the *lishan Sumeri*, or 'Sumerian language,' referred to in an inscription published by Bezold. It is generally supposed that they came into Babylonia from East Arabia, that they found the Sumerians already in possession of the land, and that the district they first occupied was called Akkad like the city. See Weissbach, in *Zeitschrift der deutschen Morgenl. Ges.* (1889, p. 661); C. F. Lehmann, *Shamash-shum-ukin* (1892); Louis Ginzburg in *Monatschrift für jüd. Wissenschaft* (vol. xliii, p. 468); R. W. Rogers, *History of Babylonia and Assyria* (1900); Ed. Meyer, *Geschichte des Altertums* (3d ed., I, 2, Stuttgart, 1913); King, *A History of Sumer and Akkad* (1910).

ACCA LARENTIA, äk'ä lá-rën'shī-ä, **ACCA LARENTINA**. In the story of primitive Rome, the wife of Faustulus, shepherd of Amulius, King of Alba Longa, who found the twin infants, Romulus (q.v.) and Remus, and carried them to her to be nursed and brought up. But this is a later legend. In the primitive Latin mythology Acca Larentia was the cultus-heroine of the festival Larentalia, held in honor of the spirits of the dead—perhaps of the dead of the original Rome on the Palatine—on December 23, in which the pontifices and the flamen Quirinalis took part. The name of the festival, Larentalia, points to a goddess Larenta, perhaps identical with a Sabine goddess Larunda. Beside the Romulus-

Remus tale various other stories were attached to the name of Acca Larentia; one made her the beloved of Hercules, another described her as a *lupa*, or 'prostitute,' who bequeathed her profits to the people for the establishment of *ludi*, or 'public games.' It has been thought that to a confusion of *lupa*, 'harlot,' with *lupa*, 'she-wolf,' the story that Romulus and Remus were brought up by Acca Larentia was due. See Theodor Mommsen, *Römische Forschungen* (vol. ii); G. Wissowa in Müller's *Handbuch* (vol. v); W. W. Fowler, *Roman Festivals* (1899) and the "Year's Work" in *Classical Studies* (1907).

ACCAULT, á'kô', MICHEL. A French explorer. He was a lieutenant of La Salle, at whose request he accompanied Louis Hennepin in the exploration of the upper part of the Mississippi in 1679. See HENNEPIN.

ACCELERANDO, *It. pron.* ät'châ-lâ-rän'dô. In music, with gradually increasing velocity of movement.

ACCEL'ERA'TION (from Lat. *ad*, to + *celerare*, to hasten). In theoretical mechanics, a term which denotes the rate of change of velocity at any instant with respect to the time, that is, the change of velocity in the next second of time if the rate of change is uniform; in other words, the change which would take place in the velocity in the next second if during that time the change were to continue at the same rate as at the instant considered. An example of acceleration is furnished by a body falling freely toward the earth. Its numerical value is about 981 centimeters, or 32.2 feet, per second in one second. Hence a body freely falling from a position of rest will, at the end of the first second, be moving with a velocity of 32 feet per second, at the end of the second second with a velocity of 64, at the end of the third second with a velocity of 96, and so on, provided, of course, it is falling in a vacuum, so that the presence of the air causes no retardation. In mathematical language, the acceleration is the limiting value of the ratio $\Delta v/\Delta t$, where Δv is the actual change in the velocity in the interval of time Δt seconds, as this interval is taken shorter and shorter. There are two kinds of acceleration, linear and angular, corresponding to the two kinds of motion, translation and rotation, and there are two types of each of these. See MECHANICS.

AC'CENT (Lat. *accentus*, from *ad*, to + *cantus*, singing, chant). A special stress laid upon one syllable of a word, by which it is made more prominent than the rest. In the Indo-European languages two kinds of accent are found, varying in quality—the musical, or pitch, and the expiratory, or stress. The first is found in Sanskrit and Greek (though in modern Greek it has changed to a stress accent), the second in Teutonic. In literary Latin, according to M. Vendryes (*Recherches sur l'histoire et les effets de l'intensité initiale en Latin*, Paris, 1902), there were both pitch and stress accents. The stress accent, to which is ascribed the elision of final syllables in Latin scansion, finally prevailed and became the accent of the vulgar tongue. It is thus that the loss of unaccented syllables and endings is explained in the transformation of Latin into French (Lat. *liberare* > Fr. *livrer*). In the modern Romance tongues (French, Spanish, Italian, etc.), the stress accent of vulgar Latin has changed again into a pitch accent. In the Celtic, Germanic, and

Slavic languages the accent is, and probably always has been, a stress accent, which accounts for the numerous contractions common to those tongues (Ger. *pferd*, bor. fr. Low Lat. *paraveredus*). In the modern Scandinavian languages, especially Swedish, the tendency is toward a pitch accent. The accent may also be distinguished by its position, as free in Greek and primitive Teutonic and fixed in later Teutonic. In English the general tendency is to throw the accent back. In compound words the accent is usually on the first part, as in *court-yard*, *highway*. When the first part is a prefix, it receives the accent if the word be a noun or adjective; the root is accented if the word be a verb. This rule applies also to some other words, as *pres'ent* and *pres'ent'*. Borrowed words usually adopt the English accent, as *orator*, *presence*; but some recently borrowed French words retain the original accentuation, as *parole*, *caprice*. The absence of stress on final inflectional syllables has played an important part in the leveling of inflections. (See ENGLISH LANGUAGE.) Besides word accents, there is a sentence accent, by which some word in the sentence is given greater stress than the others. This is always a free accent, the position of the accent depending upon the meaning. In the sentence, "Where is he?" three different meanings can be given by shifting the position of the accent. The effect of sentence accent is often seen in the development of doublets, or words with a common origin, but a different form and meaning, as *to—too*, *of—off*. (See PHONETIC LAWS.) Accent is also the essential principle of modern verse. (See VERSIFICATION.) For the primitive Indo-European accent and its effect in connection with conjugation, see PHILOLOGY. Consult: Rippman, *The Elements of Phonetics* (London, 1910); Hirt, *Der indogermanische Akzent* (Strassburg, 1895); De la Grasserie, *De l'accent comparé dans les diverses langues* (Paris, 1909).

In Music, the term is analogous to accent in language, the stress or emphasis given to certain notes or parts of bars in a composition. It may be of three kinds: grammatical, rhythmical, and rhetorical or æsthetic. The first always falls on the first note of a bar, long or compound measures of time having secondary accents—only slightly marked. The rhythmical accent is applied to the larger component parts of a composition, such as phrases, themes, motives, etc., and marks their entrance, climax, end. The rhetorical accent is irregular, and is marked by the composer by special signs (*sf*, <, ^) over notes which otherwise would bear no accent. In vocal music well adapted to words, the words serve as a guide to the right use of the rhetorical accent. See SYNCOPATION; RAGTIME.

ACCEN'TOR (Lat., one who sings with another, from *ad*, to + *cantor*, singer). A book name for a group of European warblers, of which the misnamed British hedge-sparrow (*Accentor*, or *Prunella modularis*) is a type; and also for the American water-thrushes, wood-warblers of the genus *Seiurus*.

ACCEPT'ANCE. The act whereby a party assumes a legal obligation tendered to him or takes title to real or personal property. Every contract involves an offer and its acceptance by the one to whom the offer is made. Every transfer of title involves a delivery of a deed, a bill of sale or a chattel, and no delivery is complete

without acceptance of the thing offered. See **CONTRACT**; **DEED**; **GIFT**.

This acceptance is sometimes implied where the delivery is made to some one else for the benefit of the grantee or donee, but the presumption of acceptance in such case may be rebutted. Thus an heir or devisee under a will is presumed to accept the inheritance or devise, but he may reject it, and his rejection nullifies the transaction and leaves him as though it had never taken place.

Specifically in the law of negotiable paper, acceptance signifies the assent of the drawee of a bill of exchange to the order drawn upon him and binds him to its payment. It is usually effected by writing the word "accepted" across the bill, with the signature of the drawee, who is then known as the "acceptor" of the instrument. An accepted bill is also commonly known as an acceptance. See **BILL OF EXCHANGE**.

ACCEPTANTS, APPELLANTS. The names given, respectively, to those among the French clergy who accepted the bull *Unigenitus* condemning Jansenism (1713), and to those who did not, but appealed to a general council to settle the controversy.

ACCEPTILATION. In the Roman law, a release of a debt made by a creditor to his debtor without receiving consideration therefor. As distinguished from the release (q.v.) of English and American law it could be made informally. See **ACCORD** and **SATISFACTION**.

ACCESS, RIGHT OF. A legal incident of the ownership of property abutting on the sea or other navigable waters or on a highway or other public lands. In addition to the general right to the use of such waters and lands, which he shares with the public at large, the adjacent owner has a right of free access which is considered a special property right, and of which, in this country, he cannot be deprived, even by the State, without due process of law and compensation. The existence of such a right as against the State was long disputed, but is now, as the result of recent decisions, firmly established. Peculiar applications of this right are to be found in the common-law rights of mooring vessels and of wharfing out in navigable waters. Its infringement has usually taken the form of a grant of the shore or of land under water for railroad or wharfing purposes, whereby the access of the riparian owner was cut off. The right is not to be confused with that of the abutting owner in a highway or private stream subject to a public use where the fee of the highway or stream is vested in such owner. See **HIGHWAY**; **RIVERS**; **RIPARIAN RIGHTS**; **WATER RIGHTS**. Consult Gould, *Treatise on the Law of Waters* (Chicago, 1900); Farnham, *Waters and Water Rights* (Rochester, 1904).

ACCESION (Lat. *ad*, to + *cedere*, to go, move). In the law of property, a mode of acquiring title to land or goods by their annexation to the real or personal property of another, whereby the thing annexed loses its separate identity. It occurs where land is gradually increased by *accretion* (q.v.) or *alluvion* (q.v.), where a tenant or stranger erects a building or attaches a fixture (q.v.) to land, and where a chattel belonging to one is improved by the addition of materials or labor of another, as in the repair of a wagon by adding a wheel or by painting it, or in the conversion of leather into shoes. The legal effect of the annexation is to

transfer the title of the thing annexed to the owner of the property so improved or increased, the identity of the former having been merged in the latter; the wheel, the paint, and the labor, in the examples given above, having disappeared as separate articles and being now inseparable parts of the wagon and the leather. The rule governing accessions is that the ownership of the principal thing carries with it that of the inferior thing. But, as the question of superiority or inferiority is not always one of price or value, the rule is sometimes difficult of application. Thus, additions and improvements to land, however extensive and valuable they may be, always accrue to the owner of the soil, and a chattel may be doubled or trebled in value by the expenditure of skill and labor without changing its ownership. But where the identity of a chattel is completely changed by the labor expended upon it, as by the conversion of malt into beer, or where it is enormously increased in value, as by the manufacture of pig iron into watch-springs, the product belongs to the person whose money and labor have effected the transformation. Of course the owner of anything which has by wrongful accession become the property of another is entitled to recover its value from the wrongdoer, whether the taking and accession were innocent or willful. See **CONFUSION**; and consult Schouler, *Treatise on the Law of Personal Property* (Boston, 1896).

ACCESSORY. At common law, a person who was not the chief actor in a crime, nor present at its performance, but was concerned in its commission, was an accessory. Treason and misdemeanors, however, did not admit of the distinction between principal and accessory, all parties to the crime being in these cases treated as principals; the former, Blackstone says, because of the heinousness of the crime, and the latter because the law does not descend to distinguish the different shades of guilt in petty offenses. An accessory before the fact is one who counsels or procures the commission of a crime, but who is neither present nor engaged in furthering the transaction when the crime is committed. An accessory after the fact is one who, knowing a felony has been committed, receives, relieves, comforts, or assists the felon. At common law an accessory before the fact could not without his consent be tried and convicted before the trial and conviction of his principal, and the acquittal of the principal operated as a bar to the trial and conviction of the accessory. The tendency of modern legislation is to convert accessories before the fact into principals, and to permit the trial and conviction of an accessory, whether the principal has been tried and convicted or not. Consult the authorities referred to under the title **CRIMINAL LAW**.

ACCHO. See **ACRE**.

ACCIDENT (Lat. *ad*, to + *cadere*, to fall, happen, occur). In the law of torts, a transaction in which one is harmed by another while the latter is acting lawfully and in the exercise of due care adapted to the exigency of the case. For example, A's and B's dogs are fighting; A beats them in order to separate them, and, as he raises his cane, unintentionally and without negligence hits B, who is standing behind him. B has no cause of action against A, as the injury was accidental. This is now the undisputed law both in England and in the United States, although formerly there was much apparent

authority in England for A's liability in such a case. See the authorities referred to under the title TORT.

In insurance law the term is defined in the more popular sense as an event happening by chance and not according to the usual course of things. See ACCIDENT INSURANCE.

In equity *accident* denotes an unforeseen event, loss, act, or omission, not the result of negligence or misbehavior in any of the parties; such as the loss of negotiable or other papers, or the accidental omission of some part of a document. In the latter case the court can require its insertion. In penalties and forfeitures, where the injury caused by omission of duty can be reasonably compensated, as in case of failure to pay rent on a given day, the court may relieve the offending party against the penalty of forfeiture. Where there has been neglect or omission through want of information or through negligence to defend a suit, the court may permit the proper steps to be taken. But as a rule, a court of equity will interfere only in favor of persons paying a consideration; so if a seal should be omitted from a conveyance made without consideration, or a clause should be left out of a will, no relief would be extended. It is also ruled that no relief will be granted against a purchaser who has acquired legal rights in good faith for a consideration of value. Consult Bispham, *Principles of Equity* (7th ed., New York, 1907). See TORT; CRIME; CONTRACT.

ACCIDENT (in insurance and philosophy). See ACCIDENT INSURANCE; PREDICABLE.

AC'CIDEN'TAL. In music, any sign outside of the regular signature calling for the chromatic alteration of any note in a composition. See FLAT; NATURAL; SHARP; MUSICAL NOTATION; KEY.

ACCIDENT INSURANCE. A form of insurance which indemnifies the insured in case of disablement or death as the result of bodily accident. Under the usual contract of accident insurance the only injuries insured against are those caused by violent, accidental, external, and visible means. It does not therefore cover cases of intentional injuries, whether self-inflicted or not, nor cases of injury or death resulting from surgical operations, where the operations were themselves rendered necessary by natural disease or weakness and not by external accident. The fact that the accident was incurred through the misconduct or negligence of the insured will not, in general, affect his rights under the policy, though some companies seek to protect themselves by stipulations that they shall not be liable in cases where the accident was due to the intoxication of the insured, or was incurred while willfully exposing himself to unnecessary danger. The number of companies that write accident insurance reporting to the New York Department of Insurance in 1911 was 45. Of these only 9 restricted themselves to accident insurance. The aggregate premiums on accident business for the year were \$20,982,099; the aggregate losses paid were \$8,876,006. Where employer's liability has been extended to cover most industrial accidents, the employer may insure his employees against accident. This is in some jurisdictions compulsory. See EMPLOYER'S LIABILITY; WORKINGMEN'S COMPENSATION; INSURANCE; ACCIDENTS, INDUSTRIAL, *Bibliography*.

ACCIDENTS, INDUSTRIAL. One of the most serious problems of modern industry, es-

pecially in the United States, arises from the wide prevalence of accidents. The railway industry has long been noted for its heavy accident rate. In the year 1912, 3625 railway employees were killed, or about 3 per thousand employed in positions exposing them to risks, and 142,442 were injured. In coal mining the fatal accident rate is even higher, $3\frac{1}{3}$ per thousand. There are no statistics for the United States as a whole giving the death rate from accident in other industries. The mortality statistics based on the census of 1910 throw some light, however, upon the problem. In the registration area, representing 56.1 per cent of the population of the United States, 22,652 males 10 years of age and over, classified by 148 groups of occupations, met death through accident; 881 females of the same age grouped in 140 occupations perished through accident. Among male deaths in the occupations studied, 1 out of 10 was accidental; of female deaths, 1 out of 30. The ratio of accidental to total deaths in the general occupations varied widely. Among teachers there was 1 death by accident to 31 by all causes; among clergymen, 1 to 30; among lawyers, 1 to 23; among salesmen, 1 to 18; in agricultural pursuits, 1 to 15.5; among carpenters, 1 to 10.8; among manufacturing laborers, 1 to 8.4; among street railway employees, 1 to 3.2; miners and quarrymen, 1 to 2.5; steam railway employees, 1 to 1.9. Over half the deaths in the last-named occupation are by accident. The ratio of deaths by accidents to total deaths was even more striking in the case of the lower age groups of railway labor. For the age group 20-24 it was 1 to 1.33; for the group 25-34 it was 1 to 1.47.

A computation of the excess of mortality in the various industries over the rate of deaths by accident in the safe trades indicates that the total number of deaths through industrial accident in the United States must be somewhat in excess of 35,000. Exact comparison with statistics of foreign countries is impossible, but it is commonly agreed that the American accident rate is far heavier than the various European rates, if number of persons engaged in an industry serves as the basis of comparison. In coal mining the American figure of $3\frac{1}{3}$ fatal accidents per thousand may be compared with the Prussian rate of 2 per thousand, the British rate of $1\frac{1}{4}$ and the Belgian rate of 1. If output serve as a basis, the comparison is not so unfavorable to the United States. There are more men killed in the United States per 100,000 tons of coal mined than in Great Britain, but not so many as in Prussia or Belgium. In consequence of wide differences in conditions, however, such comparisons are of little value, and the same thing is true of comparisons of accident rates on the railways.

Statistics of non-fatal accidents are even less complete than statistics of fatal accidents. The number of railway employees in the United States injured through accidents is very near 150,000 per annum. In round numbers, 40 are injured to 1 killed; of those injured, it is estimated that 1 out of 10 is either partly or wholly disabled for life. Similar proportions seem to obtain in industry: In New York 2.4 per cent, in Wisconsin 2.1 per cent, in Massachusetts 2.46 per cent of industrial accidents are fatal, according to F. L. Hoffman's calculations. Assuming these ratios to hold for the general industry of the United States, it appears

that industrial accidents cost annually, besides 35,000 lives, 1,400,000 injuries sufficiently severe to deserve reporting, 140,000 of which represent permanent disabilities.

That a large proportion of industrial accidents is preventable is generally recognized. All modern States have enacted statutes requiring the employer to fence dangerous machinery and to introduce other measures for the protection of employees. Such laws are enforced through factory inspection, which, however, in many American States is so inadequate that the laws are practically without effect. In the Wisconsin law creating an industrial commission, it is provided that the employer shall take reasonable precautions against risk, and it is left to the industrial commission to determine what safety devices the employer shall be required to install. It is the duty of the commission to keep itself informed as to all improvements in safety devices and to secure their adoption by employers so far as may be practicable.

The effectiveness of safety devices is conclusively established by a report published in 1913 by the Department of Labor on *Accidents and Accident Prevention in the Iron and Steel Industry*. In 155 steel plants, with 158,604 employees, which were studied, the accident rate for all the plants was, per thousand, 1.86 fatal accidents, 2.72 permanent disabilities, and 240.6 temporary disabilities. A number of the plants were grouped into three classes, according to the comprehensiveness of their systems of accident prevention. In the first class the general accident rate was 167.1 per thousand; in the second, 272.4; in the third, 507.9. The records of one of the best mills (employing about 8000 men) show a decline in the accident rate from 370 per thousand in 1900 to 109 in 1911.

The late development of safety devices in industry is explainable partly by the conservatism of employers, but chiefly by the cost. In the period 1906 to 1912 the United States Steel Corporation expended over \$4,000,000 in installing safety devices, and its annual expense for maintaining its safety system amounts to three-quarters of a million. The results of the system have been a reduction of nearly 45 per cent in fatal and disabling accidents, and a still greater reduction in less serious accidents.

A great impetus has been given to the invention and installation of safety devices by the extension of the principle of employer's liability. Where employers are forced to insure themselves against the liability for injuries to their employees, differential insurance rates place the employer with inadequate safety devices at a serious competitive disadvantage. Consult: Adams and Sumner, *Labor Problems*, with bibliography at end of chap. 12 (New York, London, 1905); Seager, *Social Insurance* (New York, 1910); L. D. Clark, *The Law of the Employment of Labor* (New York, 1911); *Report of the Commission (New York) on Employers' Liability and Other Matters* (1910); Frankel and Dawson, *Workingmen's Insurance in Europe* (New York, 1910); *American Labor Legislation Review*, vol. ii, no. i, part i; Henderson, *Industrial Insurance in the United States* (Chicago, 1909); Commons (editor) *Trade Unionism and Labor Problems* (Boston, 1905) and Tolman and Kendall, *Safety: Methods for Preventing Occupational and Other Accidents and Diseases* (New York, 1913). See EMPLOYER'S LIABILITY; WORKINGMEN'S INSURANCE; WORKINGMEN'S COMPEN-

SATION; INSURANCE, *Employer's Liability Insurance*; RAILWAYS, *Accidents*.

ACCIPITRES (Lat. pl. of *accipiter*, the common hawk), or RAPACES, or RAPTORES. See BIRD OF PREY.

ACCIUS, äk'shī-ūs. See ATTIIUS.

ACCLAMATION (Lat. *acclamatio*, a calling to, from *ad*, to + *clamare*, to shout, call). An expression of opinion, favorable or unfavorable, by any assembly by means of the voice. Among the Romans acclamation was varied in both form and purpose. At marriages the spectators would shout "Io Hymen," "Hymenæ," or "Talassio." A victorious army or leader was greeted with "Io triumphe" or "Imperator." In the theatre approbation for the play was asked for by the actor who spoke the closing words and added "Plaudite." In the senate opinions were expressed and votes passed in such forms as "Omnes, omnes," "Æquum est," "Iustum est," etc.; and the praises of the Emperor were celebrated in certain prearranged sentences which seem to have been chanted by the whole body of senators. When a Roman died, his eyes were closed by one of those present; all then raised a cry (*acclamatio*, or, more properly, *conclamatio*): his name was called three times, perhaps to recall him to life if possible, perhaps, rather, in lamentation. Authors who recited their works in advance of publication were greeted by various cries, such as *bene*, *sophos*, *rursus*. At first the acclamation at recitations was genuine; but the modern *claque* was early introduced by rich pretenders to literary ability, who kept paid applauders not only for themselves, but lent them to their friends (indeed there had been a *claque* in the theatre as early as the second century B.C.: there was a *claque*, too, in the courts). Nero caused 5000 chosen knights and commoners at a given signal to chant his praises in the theatre; they were called "Augustani" and were conducted by a regular music-master. In the early times of the Christian Church it was not uncommon for a congregation to express its approbation of a favorite preacher during the course of his sermon, and in this manner Chrysostom was frequently interrupted. In ecclesiastical councils voting by acclamation is very common, usually with the formula "placet" or "non placet."

ACCLIMATIZATION. The adaptation of a species or race to a climate different from that to which it has previously been accustomed. Acclimatization is often confused with naturalization (q.v.), but naturalization is rather the establishment of a species in a new country, and does not necessarily imply a slow adjustment to conditions that are at first injurious, as is the case in acclimatization. Naturalization may take place without any real acclimatization, as when the new country is climatically like the old. This case is illustrated by the large number of plants which have spread eastward or westward along parallels of latitude. Again, acclimatization may occur without naturalization. This is well illustrated by the large number of plants that are hardy and yet rarely, if ever, run wild; probably the struggle for existence is so keen that such plants fail to establish themselves spontaneously. Still again, naturalization may accompany acclimatization, as in the case of plants that migrate along meridians.

The term "acclimatization" is employed by the zoölogists in a somewhat broader sense, especially when referring to the adaptation of

marine organisms to new conditions of existence. In the latter case climatic changes are relatively unimportant factors. The changes in the character of the water, as respects temperature, contained food supply, marine currents, and pressure as determined by depth, are the influential factors.

In Plants. The most obvious examples of acclimatization are found in cultivated plants. While the original stock as well as the home of most cereals is not definitely known, it is believed that most of them have come from warm, temperate, or semi-tropical countries. They have now become fully acclimatized in far northern regions; indeed, some varieties of wheat, barley, etc., flourish even better in cold, temperate districts than in their original home. The peach is believed to grow farther north now than in the days of the ancient Greeks. Evidences of acclimatization apart from man's influence are not wanting; for example, it has been shown that plants grown from seeds that mature at high altitudes are hardier than those grown from seeds that mature at low altitudes.

One of the most interesting results of acclimatization is the change of the plant periods. In Finland and northern Norway barley ripens in 89 days, while 100 days are required in southern Sweden. Varieties of corn which ripen in New York in 93 days require 105 days in Texas. Interesting but not altogether harmonious results have been obtained from deciduous plants taken from temperate into tropical evergreen regions. In most plants the leafless period is shortened, and in some cases (notoriously in the peach tree) it is eliminated altogether, the plant becoming an evergreen. Schimper has observed another change, viz., the gradual loss of rhythmic growth; trees of temperate climes becoming in this respect more and more similar to native tropical trees.

In some cases the capacity for acclimatization is incomplete, i.e., plants are unable to adjust all of their structures and functions to a new climate. This lack of adjustment is seen in some plants of warm regions which, when transported to cool regions, vegetate well but fail to ripen wood. Many plants that can perform all their vegetative functions may still be unable to mature seeds; this is true not only of plants taken into cooler climates, but also in some cases of plants transported into warmer climates. Some species occurring naturally in Spitzbergen are said never to ripen seed; since their reproduction is now wholly vegetative, their original appearance in that region probably was at a period when the climate was much warmer than at present.

Darwin and others have discussed the influence of individual variation as compared with variation through offspring on the acclimatization of a species. There can be but little doubt of the gradual adaptation of a race through the natural selection of the hardiest individuals of each generation. Darwin also believed in the power of an individual to become acclimatized. The Wyoming experiment station reports that potatoes from the same stock endure in the uplands frosts that would destroy them in the lowlands. This favors the idea of individual acclimatization. Oranges, however, propagate hardier forms by seeds than by grafts, which shows that gradual acclimatization through offspring may be more important. Northern-grown seeds are preferred by farmers, partly

because plants grown from them mature sooner than from home-grown seeds. In a few generations, however, this hereditary peculiarity is lost, and a new supply becomes necessary. It should be borne in mind that many of the above statements are based on imperfect observations, and that there is the greatest need for careful experiment in this field.

In Animals. The capacity of adapting themselves to changed environment is not possessed to the same degree by different species of one genus or by the individuals of any species. It varies with the hardihood, with the capacity for resistance, both of the individual and of the species. Just what the changes are, whether chemical or physical, that go on in the protoplasm of the body during the period of acclimatization, we do not, in many cases, know. In the acclimatization of fishes to denser media it is apparent that some solids are taken into the body, for the fishes sink when transferred again to fresh water. Some organisms possess a remarkably high degree of acclimatization. Thus, few animals can resist a temperature of over 115° F., while 105° F. is the death-point of whole groups. Yet certain organisms live in hot springs in water of much higher temperature, although they may be similar in kind to, or even identical with, those that live in cooler waters outside, and probably were acclimated to the high temperature by slow degrees as they made their way up the outlets into the springs. We know from experimentation that organisms can resist an amount of heat, of density, or of poison when accustomed to it by slow degrees, that would have been fatal had they been subjected to it suddenly. We owe the fact that certain domestic animals, such as the horse, cattle, dog, cat, fowls, rats, and mice, have spread with mankind over nearly all the world to the great capacity for acclimatization of these forms, most of which have originated in warm climates. Likewise the ubiquity of such food-plants as the potato and cereals, as well as certain weeds, is due to their great capacity of adaptation; for those plants and animals that have a limited amount of adaptation have likewise a limited range of distribution. The quality and the strength of some animals seem actually to improve in a new climate. Thus the merino sheep imported into Silesia and Pomerania from Spain seem to be superior in those lands to their Spanish ancestors, while the fleece of the Syrian sheep becomes finer in Spain; but in such cases it is difficult to say just how much is due to climate and how much to the breeder's skill and care. Many of our domestic animals have been so long in the countries in which we now find them that we can never hope to know anything about the history of their importations; but the silkworm is comparatively so late an importation into Europe that we can follow its progress. It was brought from China first into Italy, and now it is acclimated not only to southern France but even to the coast of the Baltic Sea, and it is able to live in some parts of the United States.

Of late years numerous acclimatization societies have been formed (the best known of which is the Société d'Acclimatation of Paris), having as their object the transference of seemingly desirable animals from their native lands to other parts of the world where they may thrive to human advantage. This has been found feasible in many instances, so far as the

ability to become acclimated is concerned, but in many cases the expected benefits have turned to evils through overmultiplication or other means of becoming a local pest, and such experiments are now rarely attempted. The introduction of salmonoid fishes from the Pacific to the Atlantic side of the United States, and from Europe to New Zealand, of bumble-bees into New Zealand, and of several insects, such as ladybirds, as enemies of agricultural pests, are instances of the more beneficial sort. The European house-sparrow in North America, the mungoos and agua-toad in the West Indies, the rabbit in Australia, and a great host of more or less accidentally introduced insects destructive of plants, etc., are cases of an opposite character. For particulars in respect to these, see accounts of the respective animals.

In People. This treats of the ability of men to maintain themselves in a country with radically different climatic conditions from those from which they migrate. At present the inevitable tendency of European and American peoples to spread over the major part of the earth gives the question many practical bearings. Can a race and a civilization from the temperate zone be transplanted to the tropics? The question is a double one: (1) Can individuals from the temperate zone live in the tropics for a few years and maintain their health and vigor? (2) can they work at their usual occupations, maintain their customary vigor, energy, and ability, rear families and propagate their kind for several generations? On the first point most authorities agree in the affirmative, provided reasonable provision for sanitation is made, and temperance and thrift prevail among such emigrants. On the second point authorities differ, with the balance in the negative. Races differ in their ability to adjust themselves to new climatic conditions. The individual or the race may not succumb at once when transferred to a very different climate, and yet the acclimatization may be only partial. Certain organs only of the body may be affected by the changes, so that "diseases of acclimatization" may be induced. Thus Europeans are liable in tropical countries to suffer from diseases of the liver, while natives of the tropics are subjected to pulmonary troubles in temperate zones. The African in the United States has a high death rate from lung affections. On the other hand, loss of hardihood induced by climate may express itself mainly in deterioration in size, as is the case with the Shetland pony. So far as the human races are concerned there seems to be a direct ratio between intelligence and capacity for acclimatization. The Anglo-German race is able to endure climatic changes with less loss of vigor than any other European race, and for this reason has been able to surpass all the others as colonizers. High moral qualities are needed. Home-sickness is a frequent cause of failure. Temperance and thrift are excellent qualities for success, as evidenced in the history of Jewish and Chinese emigration. Mankind is tolerant of great extremes of climate, -97° F. to 154° F. being the greatest extremes recorded as having been endured by human beings, though no such range of variation has ever been endured by one people or in any one place. Not only temperature but also meteorological conditions have an effect, and moisture is, next to temperature, the most important element.

Bibliography. The best general treatment of acclimatization may be found in Semple, *Influences of Geographic Environment* (New York, 1911); J. Hann, *Handbuch der Klimatologie* (Stuttgart, 1897); Darwin, *The Variations of Animals and Plants under Domestication*, revised ed. (London, 1875); Pavillard, *Eléments de biologie végétale* (Paris, 1901); Schimper, *Pflanzengeographie auf physiologischer Grundlage* (Jena, 1898); Hollick, "Relation between Forestry and Geology in New Jersey," *Geological Survey of New Jersey, Annual Report* (Trenton, 1899); Wallace, *Island Life* (London, 1880); Heilprin, *The Geographical and Geological Distribution of Animals* (New York, 1887); Wallace, *The Geographical Distribution of Animals* (2 vols., London, 1896). A popular treatment of acclimatization of peoples is given in Ripley, *Racial Geography of Europe* (Boston, 1899), in which book there are also excellent bibliographical references; also A. Ireland, *Tropical Colonization* (New York, 1899); Peschel, *The Races of Man and their Geographical Distribution* (London, 1878); Ward, *Climate Considered Especially in Relation to Man* (New York, 1908); and Heilpach, *Die geopsychischen Erscheinungen Wetter, Klima und Landschaft in ihrem Einfluss auf das Seelenleben dargestellt* (Leipzig, 1911).

ACCO, or ACCHO, äk'kō. See **ACRE**.

ACCOLADE, äk'kō-lād' (Fr. an embrace, kiss, from Lat. *ad*, to + *collum*, neck). A part of the ceremonies of conferring knighthood in the Middle Ages. The sovereign or other superior embraced the aspirant around the neck (*ad collum*). The term is sometimes applied to the later ceremony of giving a slight blow on the shoulder with the flat of the sword.

AC'COLON. In Sir Thomas Malory's *Morte d'Arthur*, a knight of Gaul, who obtained possession of King Arthur's sword Excalibur through the treachery of Morgan le Fay. He died after his fight with the King (book iv), which had led to the discovery of the trick and the recovery of the sword.

ACCOLTI, äk-kōl'té, **BENEDETTO** (1415-66), called the Elder. An Italian jurist. He was born at Arezzo, Italy, and died at Florence. At first a professor of law at Florence, he afterward became chancellor of the Republic, and occupied this position until his death. He was gifted with a marvelous memory, and is said on one occasion to have repeated word for word a Latin discourse which the Hungarian Ambassador had addressed to the magistracy of Florence. His historical attainments were considered inferior to his knowledge of law. Accolti's principal publications are *De Bello a Christianis contra Barbaros Gesto pro Christi Sepulchro et Iudaea Recuperandis Libri Quatuor* (Venice, 1572; Florence, 1623, with a commentary by Scoto), which furnished the material for Tasso's *Jerusalem Delivered*; and *Præstantia Virorum sui Ævi* (first published at Parma in 1689 and frequently reprinted). Consult Potthast, *Bibliotheca Historica Medii Ævi*, vol. i (Berlin, 1896).

ACCOLTI, BERNARDO (1465-1536). An Italian poet, a son of Benedetto Accolti (q.v.). He was born at Arezzo and is said to have enjoyed so much popularity as a poet that the shops were closed and multitudes (composed of the most learned statesmen and divines, as well as of the unlettered masses) flocked to hear him recite his verses. But although styled by his

contemporaries "The Unique," such portions of his works as have come down to us scarcely justify so high an estimate of his ability, although as an improvisator he may have excelled. His poems were first published at Florence in 1513 under the title: *Virginia, commedia, capitoli, e strambotti di Messer Bernardo Accolti Arcino*. They were republished at Venice in 1519 and have since been frequently reprinted.

ACCOMMODATION (Lat. *ad*, to + *modus*, fit, suitable). The power of altering the focus of the eye so that rays coming from an object nearer than 20 feet are brought together on the retina. This is brought about by changes in the convexity of the crystalline lens (q.v.). The latter possesses a degree of elasticity which tends to make it assume a spherical form. The lens being suspended by a ligament extending around its periphery, the ciliary muscle is so attached that when it contracts it causes a relaxation of the suspensory ligament. This diminishes the tension upon the latter and allows the lens to become more spherical, chiefly on its anterior surface. At the same time the pupil contracts, and the visual lines of the two eyes converge. The *range of accommodation* is the distance between the "far point" (*punctum remotum*) or the farthest point of distinct vision and the "near point" (*punctum proximum*), or nearest point at which the eye can distinctly see objects. As age increases, the power of accommodation gradually diminishes and the near point recedes. At 10 years the mean or average range of accommodation is 14.2 inches; at 20, it is 11.6 inches; at 30, 8.6 inches; and after 45 it diminishes rapidly (the onset of *presbyopia*) until at 70 its range is only 1.1 inch. At 75, accommodation is practically lost.

Paralysis of Accommodation may accompany diphtheria, syphilis, gout, brain tumor, locomotor ataxia, and poisoning from alcohol or tobacco. Complete and permanent loss of accommodation occurs after the removal of the crystalline lens for cataract. **Spasm of accommodation** follows excessive use of the eyes, particularly far-sighted or astigmatic eyes, for near work. See VISION.

ACCOMMODATION (IN THEOLOGY). 1. The adaptation of Scripture texts to other than their original meanings. 2. The theory that Jesus Christ, while possessing complete knowledge, did not correct the errors of his time, e.g., belief in demon possession, and so *accommodated* himself to the limitations of his contemporaries in scientific and historical knowledge.

ACCOMMODATION BILL OR NOTE. A draft, bill of exchange or promissory note, one or more of the parties to which has signed it without receiving value therefor, and for the purpose of lending his credit to some other party thereto. Such a bill is a valid, negotiable instrument, and the accommodation party, whether known to be such or not, is liable thereon to a holder for value. But, as between himself and the party accommodated, he is only a surety, and is, as such, exonerated by the giving of time to the principal debtor without his assent. See PRINCIPAL AND SURETY; BILL OF EXCHANGE; NEGOTIABLE INSTRUMENTS, and the authorities therein referred to.

ACCOM'PANIMENT. The additional instrumental part which, in music written for a solo voice or instrument, gives harmonic and rhythmic support to the solo part or melody; as the pianoforte part in a song, the orchestral

part in a concerto, etc. An *ad libitum* accompaniment is one that is not a part of the structure of the composition, and may therefore be performed or omitted at pleasure. An *obligato* accompaniment, on the contrary, forms an integral part of the music and is indispensable. In the scores of the old masters, especially those of Handel and Bach, the accompaniments were not written out in full. A single bass part was given, and the accompanying harmonies were indicated by figures over the notes. This species of musical shorthand became known as figured or thorough bass, and also *basso continuo*. (See FIGURED BASS.) The accompanist at the organ or harpsichord translated these figures at sight into their equivalent harmonies, and with them improvised, with runs, trills, and various ornaments, the sort of accompaniment that the music needed. The musicians of the time became very expert at this difficult accomplishment, both Handel and Bach being renowned for their wonderful polyphonic accompaniments. Many of these old scores have been worked out by skilled musicians, who have filled out the missing parts and arranged the accompaniment for the modern orchestra. Among the scores to which "additional accompaniments" have been written are those of Handel's *Messiah*, by Mozart; *Israel in Egypt*, by Mendelssohn; and the great edition of Bach's works, by Franz. Beginning with Schumann, the accompaniment of songs has steadily become more elaborate and expressive, until in the songs of Richard Strauss and Hugo Wolf the instrumentalist is now the real interpreter, since the most important themes are frequently allotted to the piano. The relation is very much the same as that between conductor and singer in Wagner's music-drama. Consult Apthorp, *Musicians and Music Lovers* (New York, 1894).

ACCOM'PLICE (through confusion with *accomplish*, for earlier *complice*, companion, especially in crime, from Lat. *complex*, closely connected, confederate). One whose participation in a crime renders him liable to punishment, either as a principal or as an accessory. Hence a person who acts only the part of a detective is not an accomplice, although he may pretend to be the criminal's confederate, for his act, not being done with criminal intent, is not punishable. The term is most frequently used in cases where one of several criminals has turned state's evidence. As his testimony against his fellows is apt to be given in the hope of securing immunity for himself, the court usually charges the jury that it is open to suspicion, and many modern statutes declare that a conviction cannot be had upon the testimony of an accomplice, unless he be corroborated by such other evidence as tends to connect the defendant with the commission of the crime. Consult the authorities mentioned under the title CRIMINAL LAW.

ACCORAMBONI, ak'kō-rām-bō'nē, VITTORIA (?-1585). An Italian woman remarkable for her beauty and her tragic history. She was sought in marriage by Paolo Giordano Orsini, Duke of Bracciano, who was supposed to have murdered his wife, Isabella de' Medici, but her father gave her to Francesco Peretti, nephew of Cardinal Montalto, afterward Pope Sixtus V. The husband was assassinated in 1581, and the widow fled from her father-in-law's house to that of the Duke of Bracciano, the supposed murderer. Pope Gregory XIII opposed her marriage to the Duke so far as to keep her a prisoner in

the castle of Sant' Angelo nearly a year, but that did not prevent their union. Not long afterward the Duke died, leaving nearly the whole of his fortune to the widow. This so incensed Ludovico Orsini, a relative, that he caused the widow to be murdered in her home in Padua, Dec. 22, 1585. Her history has been made the subject of novels and plays, among others, of Webster's tragedy, *The White Devil*. Consult Gnoli, *Vittoria Accoramboni* (Florence, 1870).

ACCORD' AND SATISFAC'TION. In the law of contracts, a mutual agreement entered into by the parties to a contract by which one party agrees to discharge the other from his obligation under the contract, in return for the other party's promise to do or give something. The satisfaction is the performance of the promise to do or give something. At common law it was early held that an accord with satisfaction was a good defense to an action founded upon simple contract, but that a mutual agreement to discharge a pre-existing contract, being mere promise given for promise, was an accord only and not a valid defense at law. This was either because mutual promises, not being good consideration for each other, were not regarded as binding, or because the law would not enforce an agreement which merely substituted one cause of action for another, or for both reasons. The first, owing to the changed conception of consideration, has ceased to exist, and the second is now generally disregarded, most jurisdictions holding that a mere accord without satisfaction is a valid discharge of a simple contract, though the decided cases are not altogether harmonious on this point. Agreements never to sue on the earlier contract were regarded as a good accord or accord and satisfaction and a valid defense, but agreements not to sue for a limited time were not admitted as a defense at common law; but equity might enforce them by enjoining action on the earlier contract. In the case of contracts under seal, before breach, accord, and accord and satisfaction were not admitted as valid defenses at common law, but after breach of the obligation under seal, it was regarded as a mere right of action for damages, of no higher nature than a simple contract and subject to the same defenses. Equity under proper conditions would enforce the accord even when entered into before breach of the contract under seal by enjoining all action upon the latter; and in most jurisdictions where equitable defenses may be pleaded at law, accord or accord and satisfaction may now be set up as a defense to an action on the instrument under seal. An accord must always be an agreement founded on good consideration. Thus, a mere agreement founded upon a promise to do or give something which the promisee was already bound to do (for example, an agreement to pay a lesser sum in lieu of a debt for a greater) is not valid as an accord. An apparent exception to this rule exists in cases where the precise amount or character of the obligation under the earlier contract was uncertain, in which case an accord by way of a compromise agreement is regarded as made upon valid consideration. A real exception to the rule was allowed in case of compromise agreements in which a debtor agreed to pay a smaller sum in lieu of a greater to his creditors in return for their promise to release him from his debts to them. In a num-

ber of the States, notably New York, a written receipt given by the creditor to a debtor without consideration and with intent to release the debts is allowed to be a valid discharge of the debts. This is anomalous. See the authorities referred to under CONTRACT.

ACCOR'DION (Fr. *accorder*, to accord, be in harmony). A musical instrument which produces its tones by the vibration of metallic tongues of various sizes, while wind is supplied by the action of a hand bellows. Two sets of tongues make it possible to produce the same tones either by pressing or pulling the bellows. It was invented by Damian of Vienna in 1829. See CONCERTINA.

ACCORSO, ak-kôr'sò, MARIANGELO (c.1490-1544). Italian critic, born at Aquila, in the kingdom of Naples. He is perhaps better known by his Latin name Accursius. Charles V, at whose court he lived for 33 years, employed him on various foreign missions. In his extensive travels he discovered and collated important manuscripts. He published *Diatribæ in Ausonium, Solinum, et Ovidium*, and brought out the first edition of the *Variæ Epistolæ* of Cassiodorus (q.v.). He edited also, better and more fully than had been done before, Ammianus Marcellinus. See Sandys, *A History of Classical Scholarship*, vol. i (Cambridge, 1911).

ACCOUNT' (Lat. *ad*, to + *computare*, to sum up, reckon, compute). In its broadest sense, a catalogue of items, debit or credit, arising out of contracts, as in the case of merchants; or out of a fiduciary relation, as in the case of principal and agent; or from a duty imposed by law, as in the case of an administrator or public officer. A mutual account is one containing reciprocal demands or charges against the parties; as the account between two merchants, or between a merchant and a customer, each of whom has sold goods to the other. Before an account is rendered or adjusted, it is spoken of as "open" or "current." A *stated account* is one which has been accepted as correct by the party against whom it states a balance. The debtor's assent to the correctness of the account as stated may be implied from his retention of an account rendered without an objection to it within a reasonable time. The acceptance of an account stated, or, to use the ordinary legal phrase, the stating of an account, is said to be in the nature of a new promise; and the creditor suing upon such an account need not set forth the subject matter of the original debt. Originally an account stated was confined to transactions between merchants; but in England and in most of our jurisdictions its scope has been extended to accounts between all creditors and debtors. In some States, however, stating an account between others than merchants does not create a new cause of action, but is available to the creditor only as an admission by the debtor. Even after an account has been stated it may be corrected for fraud or mutual mistake.

The action of account at common law has fallen into disuse, partly because it was difficult, dilatory, and expensive, but chiefly because a court of equity possessed more extended authority and better machinery in cases involving an account. Equity will entertain an action for an accounting where a fiduciary relation exists between the parties, such as that of principal and agent (q.v.), trustee and *cestui que trust*, guardian (q.v.) and ward; or where there

is a mutual account between plaintiff and defendant; or where there are circumstances of complication, as in partnership (q.v.) accounts. So an accounting may be had as incidental to the exercise of other equity jurisdiction, as in mortgage foreclosures.

ACCOUNTING. In consequence of the increasing magnitude of business operations, both private and public, accounting, or the art of exhibiting such operations in their true financial significance, has undergone a notable development in the last half-century. In the small individual or partnership enterprise, especially in the field of commerce, the accounting function is represented by book-keeping (q.v.); and the modern art or science of accounting is sometimes described as merely a broad application of the principles of book-keeping. Book-keeping, however, is a mechanical function, requiring only accuracy and observance of the rules of a clearly defined system. Accounting, while employing book-keeping methods, is concerned, above all, with problems of classification of uncertain items and with problems of valuation. The accountant is expected to command a wide knowledge of business in general, as well as special knowledge of the particular field of business in which his services are employed. Accounting and book-keeping have become differentiated, in practice, as profession and trade. The profession of accounting is comparatively new, but it has already developed an extensive literature, a specialized form of training, and a vigorous professional organization.

The profession of accounting, as more or less distinct from book-keeping, was given its first impetus by the extension of joint stock or corporate enterprise. To protect the interests of the various classes of security holders, as well as those of new investors, it was necessary to make public from time to time statements showing the true condition of each important enterprise. In the case of trading companies this is a comparatively simple matter, assuming absence of fraud, since the assets of such companies consist chiefly in cash, bills and accounts and mercantile stocks that may properly be entered at cost price, and since the liabilities consist of items readily reducible to money terms. The problem is far more difficult in the case of companies engaged in manufacture, mining, and transportation. In these fields a relatively large part of the assets of the company consists in lands, buildings, machinery, etc., which are subject to depreciation or appreciation. The true net profit of the company is determined only after allowance has been made for changes in valuation.

In Germany, Austria, France, Switzerland, and Belgium all corporations are required by law to set apart a special account to cover depreciation of plant or to deduct an amount representing depreciation from the book value of the depreciating asset. In England and the United States there are no legal regulations requiring this, but the rule is observed by many corporations and is imposed by law upon certain classes of public service corporations. The observance of the rule is gradually extending through the influence exerted by professional accountants.

It is a general rule of accounting that the land used in a business shall be kept on the books at its original cost price, since increase or decrease in its selling price can be of no interest

to the company as a going concern. Buildings and machinery inevitably deteriorate or become obsolete; but the rate of depreciation differs widely in different enterprises, and can in no case be determined accurately. Accordingly even the best accounting practice is more or less arbitrary in its disposition of such value changes. The rule is to overestimate rather than underestimate depreciation. Changes in value of stocks of finished goods or materials in store or in process of manufacture are commonly ignored, if in the direction of appreciation; but allowance is made for them if they represent depreciation. This is the rule followed in the main by the German law; Austrian law requires both appreciation and depreciation to be taken into account. Securities held for investment are commonly kept on the books at their original cost, unless market quotations indicate depreciation, in which case the market price is substituted. This also is the rule of German law, while Austrian law requires the book values to follow the market value in case of either appreciation or depreciation. As the foregoing instances indicate, it is a general principle of accounting, both in America and England, where it is free from legal regulation, and in Germany, where it is strictly regulated by law, to err, if at all, on the conservative side.

A closely related problem of accounting is the treatment of good-will. A successful business enterprise develops a clientèle which enables it to dispose of its goods at better prices or with lower selling expenses than can its competitors. Such a standing with its customers is a valuable asset and upon the winding up of the company would command a price. It is the best accounting practice, however, to make no allowance, or merely a nominal allowance, for good-will, except in cases where it has been acquired at a definite outlay. In such cases good-will is entered at cost. Accounting practice in this respect is explained by the fact that good-will, as an asset, is more or less evanescent, and its inclusion in the capital account opens the way to excessive inflation.

The replacement of buildings, machinery, etc., that have become worn out or obsolete presents no serious accounting problem when the new buildings or machinery are essentially of the same cost and technical efficiency as the old. Such replacement, in a properly constructed system of accounts, is treated as a revenue expense. When old plant is replaced by plant of a superior order and at an advance in expense, the problem arises whether the expense should be charged to revenue or should be met out of the capital account. This problem has assumed serious proportions in American railway accounting. It has been the practice of some roads to charge to revenue not merely improved rolling stock and betterments in track, such as reduction in grades and substitution of iron for wooden bridges, but also extension of main line and construction of branches. The practice has been defended on the ground that under conditions of railway competition the railroad which does not steadily improve its equipment will lose business; hence a normal degree of improvement must be regarded as a current expense, essential to the protection of the current revenue. This view is not, however, accepted by the Interstate Commerce Commission, which is authorized by the law of 1906 to prescribe a uniform set of accounts for rail-

ways engaged in interstate commerce. In the view of the Commission, all improvements that increase the value of the plant should be charged to capital.

In the case of ordinary business enterprises the chief public function of accounting is to aid creditors in determining the probable value of its securities. In the case of public service corporations accounting assumes an additional function. Where the public authority regulates the charges of such corporations, it is of the utmost importance to determine the actual magnitude of the capital upon which interest and dividends may be paid. It is equally important to determine the true net profits, since the relation between capital and profits indicates whether charges fixed by the corporation are excessive, or whether charges fixed by the public authority are confiscatory. In this field there is a strong tendency in American state legislation to regulate narrowly the form of accounts, to prescribe rules for allowances for depreciation and for the disposition of betterment and extension charges.

The accounts of States, municipalities, and counties in the United States are as yet almost universally in a primitive condition. Account is kept of revenue and appropriations, but as a rule only with a view to checking peculation. There is no uniformity among the several States and cities in the classification of either revenues or expenditures; the same State or city is likely to make frequent changes in its system of accounts. As a result comparative study of costs with a view to throwing light upon the problem of administrative efficiency is almost impossible. In consequence of the growing public interest in municipal affairs a number of cities, among them New York, have recently introduced scientific systems of accounting.

Cost Accounting. Since 1885 the principles of accounting have found increasing application to the control of production. The manufacturer of an earlier period reckoned his profits or losses upon an enterprise as a whole; whether particular operations were profitable or not seemed to admit of no exact determination. This still remains true in a wide field of industry. Recent studies in agricultural economics have shown that on many farms which are on the whole profitable, certain crops or certain classes of live stock are produced at a loss. It is the object of cost accounting to assign to each article produced or to each operation performed its proper share in the costs of the enterprise as a whole, in order to direct the labor and capital of the enterprise to the most productive channels. In some fields, as in agriculture, the problem presents no serious difficulties, as the value of the labor, materials, and use of land make up practically the whole cost and are determinable with fair accuracy. In the case of a factory or machine shop general costs, such as charges for power, light, depreciation, expenses of supervision and management, are not strictly assignable to the several units of product. In practice cost accountants distribute such charges according to somewhat arbitrary bases, such as the amount of wages paid on the several pieces of work, the number of hours of labor required by it, the cost of labor together with the cost of material entering into the product, etc. One authority on cost accounting assigns to each unit of product not only the estimated labor and material charges it occa-

sions, but also a machine charge, representing the interest and depreciation on the machine used, power required by the machine when in operation, lighting, rent and taxes on the building assigned to each machine in proportion to floor space occupied. Some general charges remain unassigned, but these make an inconsiderable addition to unit costs. The system is in practice extremely cumbersome, and, in spite of its appearance of accuracy, is hardly less arbitrary than the simpler systems. No scheme of cost accounting succeeds in determining exactly what margin of profit a given price represents. It does, however, frequently indicate what one among several lines of production is the more profitable. Comparison of cost accounts through a period of time often serves to detect wastes that would otherwise have remained unnoticed. In the case of a corporation controlling several factories producing the same commodity, comparative cost accounts serve as an effective check upon careless or wasteful management, or indicate when it would be profitable to dismantle one factory and concentrate business in another. Cost accounting has been widely advocated as a principle of control in business undertaken directly by the public authorities, such as street cleaning and garbage disposal, as a means of indicating changes in administrative efficiency.

Consult: Hatfield, H. R., *Modern Accounting* (New York, 1909); Cole, W. M., *Accounts* (Boston, 1908); Dicksee, L. R., *Advanced Accounting* (London, 1903); Bentley, H. C., *The Science of Accounts* (New York, 1911); Rehm, H., *Die Bilanzen der Aktiengesellschaften* (Munich, 1903); Sprague, C. E., *The Philosophy of Accounts* (New York, 1908); Dawson, S. S., *Accountant's Compendium* (London, 1908); Lisle, G., *Encyclopædia of Accounting* (8 vols., Edinburgh, 1903-08); Day, C. M., *Accounting Practice* (New York, 1908); Mitchell, G. A., *Single Cost Accounts* (London, 1907); Garry, H. S., *Multiple Cost Accounts* (London, 1906); Burnell, S. H., *Cost-keeping for Manufacturing Plants* (New York, 1911); Webner, F. E., *Factory Costs* (New York, 1911); Bureau of Municipal Research, *Handbook of Municipal Accounting* (New York, 1913). See BOOK-KEEPING; SCIENTIFIC MANAGEMENT.

AC'CRA. See AKKRA.

ACCRETION (Lat. *accretio*, an increase, from *ad*, to + *crecere*, to grow). In law, the gradual extension of the boundaries of land at the expense of the sea, or of a neighboring owner, by the imperceptible action of natural forces, as by the recession of the ocean, the deposit of silt and earth by a stream, the drying up of a pond, etc. The word is sometimes, though improperly, used to include the various kinds of accession (q.v.) and as the equivalent of that term; but it is in its legal sense properly applicable only to that form of accession in which land is added to other land by the process above described. Where the land so gained is washed up by the sea, or deposited by a running stream, or left bare by the gradual drying up or retirement of the water boundary, it is known as alluvion (q.v.). As above indicated, the process must, in order to result in an accretion, be so slow as to be imperceptible in its progress. If sudden, no change of ownership results, the land so exposed remaining the property of the sovereign or of the neighboring pro-

prietor affected thereby. Thus a boundary stream may, by changing its course gradually, little by little transfer the ownership of the land on one side to the opposite proprietor, whereas a sudden change of course would not affect the boundaries of the two parcels of land in the slightest degree. Consult: Gould, *Treatise on the Law of Waters* (Chicago, 1900); Angell, *Treatise on the Law of Watercourses* (Boston, 1877).

AC'CRINGTON. A manufacturing town in Lancashire, England, situated in a deep valley, surrounded by hills, 23 miles by rail north of Manchester and 5 miles east of Blackburn, on the banks of the Hindburn (Map: England, D 3). Among its notable buildings are Christ Church, a fine Gothic edifice, erected in 1838, and the town hall, a handsome building in the Italian style. The town was incorporated in 1878. The inhabitants are mostly employed in cotton factories, dye-works, chemical works, weaving, and calico-printing. Accrington is considered the centre of the cotton-printing industry. There are coal mines in the neighborhood, in which many of the people find employment. Accrington is advantageously situated in regard to communications, being a station on the Lancashire and Yorkshire Railway. To this last it owes much of its growth, which has been very rapid. With a population of less than 9000 in 1841, it rose to 38,603 in 1891, and in 1901 to 43,122. The 1911 census returned 45,031.

AC'CUBA'TION (Lat. *ad*, to + *cubare*, to lie down). The reclining posture of the Greeks and the Romans at table. Among the Greeks a low table was placed beside each couch; on each couch usually two persons reclined, resting on the left arm, which was supported by cushions. Among the Romans three couches were placed about a table, so as to form three sides of a square, and three persons reclined on each couch. The middle couch was the most honorable. In later times, especially under the Empire, round tables were used, and the couches were arranged in crescent form, and were then known as *sigma* (one form of the Greek letter sigma was **C**). Respectable women, however, did not recline at table until the time of the Roman Empire.

ACCUM, äk'kum, FRIEDRICH (1769-1838). A German chemist. He was born in Westphalia, went to London in 1793, and became professor of chemistry there in 1802. He was known chiefly on account of his work, *A Practical Treatise on Gaslight* (1815), which had the effect of introducing the illuminant in England. The book was translated into several languages. In 1822 he became professor in a technical institute in Berlin. He is also author of *Chemical Amusement* (1818) and *Culinary Chemistry* (1821).

ACCU'MULA'TIONS (Lat. *ad*, to + *cumulare*, to pile, heap). In law, the accumulated interest and income of property held in trust upon a trust created for the purpose of effecting such accumulation for the benefit of the *cestui que trust* (q.v.). The law relating to accumulation is closely related to the rule against perpetuities (q.v.) as now defined by modern statute. It was the common law rule that any disposition of real estate which postponed a vesting of any interest in the estate for longer than a life or lives in being and 21 years additional thereafter was absolutely void. This rule was deemed to be violated by the creation of a trust for accumulation for any greater period.

This continued to be a rule of decision until the passage by the English Parliament of the so-called Thellusson Act. (See *Thellusson v. Woodford*, 4 Ver. p. 227.) This act placed several limitations on the common law rule as to accumulation. The rule relating to accumulation is now regulated wholly by statute in most jurisdictions, and generally the power to create trusts for accumulation is limited to the creation of a trust for the life of the grantor only or for 21 years or during the minority of the beneficiary. See the authorities referred to under TRUST and PERPETUITY.

ACCU'MULA'TORS. Apparatus for equalizing pressure or for the storage and accumulation of energy for intermittent use. The storage battery and the Leyden jar and all forms of condensers in coil or other shapes are electrical accumulators. (See STORAGE BATTERY; CONDENSER.) Hydraulic accumulators are extensively used in connection with hydraulic machinery for operating cranes, punching and riveting machines, presses, etc. As water is practically incompressible, no volume of it can be drawn from a pressure system for the use of any machine without an instant fall of the pressure, unless an equal volume is supplied from somewhere else in the system. The simplest way of storing up water for pressure purposes is to erect a tank at a sufficient height to give the required pressure by the weight or head of the water column alone. This arrangement is generally adopted for hydraulic elevators in warehouses and lofty buildings. (See ELEVATORS.) Where very high pressures are required, however, it becomes impracticable to adopt a tank or water tower, since the elevation required to give the necessary pressure would be impracticable; to obtain 700 pounds pressure, for instance, requires a tank 1610 feet high. Hence a pump capable of giving the required pressure and of maintaining it is required; but its capacity would have to be that of the maximum demand for water. This would keep it idle when the machines were not at work, and to secure economy in such cases accumulators are employed. They generally assume the form of a vertical cylinder resting on a firm base and having a plunger working through a stuffing-box at the top. This plunger has at its upper end a yoke which carries by means of suspension rods a heavy weight of cast iron or other heavy material. The power pump forces water into the cylinder at a pressure a little above that desired in the system, which is therefore sufficient to lift the weighted plunger to the top of the cylinder, but as the cylinder fills, the power is gradually shut off from the pump, until the pressure of water just balances and supports the weighted plunger on its top. As water is drawn off from the cylinder to supply the crane, press, riveter, or other machinery, the weighted plunger descends, always keeping a pressure on the top of the water column equal to the pressure per square inch required to balance the combined weight of the plunger and its load and supplying a mass of water greater than the capacity of the pump in the time consumed in the descent of the plunger. As soon as the plunger descends the pump resumes work and raises it again. By this combination of operations the water pressure is always kept constant for supplying the hydraulic machinery. Sometimes steam or air pressure acting on the outer end of the plunger is substituted for the more common suspended

weights, and if more convenient such plungers may be then arranged to work horizontally. Hydraulic accumulators are built to give pressures ranging from five pounds to ten tons per square inch. Consult: Lyndon, *Storage Battery Engineering* (New York, 1911); and Morse, *Storage Batteries: The Chemistry and Physics of the Lead Accumulators* (New York, 1912).

ACCURSIUS, a-kūr'shī-ūs. See ACCORSO.

AC'CUSA'TION. A legal term which signifies either the act of charging one with a crime or the charge itself. When the charge is made outside of a judicial proceeding, it may subject the accuser to an action for defamation (q.v.), while if made in the course of a judicial proceeding it is generally not actionable. A threat or a conspiracy to accuse another of a crime is an indictable offense. See BLACKMAIL; EXTORTION; MALICIOUS PROSECUTION.

ACCU'SATIVE CASE. See DECLENSION.

ACELDAMA, ā-sēl'dā-mā, or **AKELDAMA**, ā-kēl'dā-mā (R. V.). According to Acts i. 19, "the field of blood." The evidence of the manuscripts is decidedly in favor of the form *Akeldamach* in the Greek text. This may indeed represent Akeldama in Aramaic, as *Seirach* (Seirach) represents Sira. But it has been suggested by August Klostermann (*Probleme im Aposteltexte*, pp. 1-8) that the second element, *damach*, is the Aramaic word "to sleep," so that the real meaning of the term is "field of sleep." The same word is used, in the Syriac version of Dan. xii. 2, of those who sleep in the dust, i.e., the dead. Such a name would have been appropriate for a field which, according to Matt. xxvii. 8, was bought by the priests of Jerusalem for a cemetery in which to bury strangers, with 30 pieces of silver which Judas Iscariot received as a reward for betraying Jesus, but which in the hour of his repentance he returned to the priests. In Acts i. 18 f. we are told that Judas obtained this field with the reward of his iniquity and, falling headlong, he burst asunder in the midst. Different traditions seem to have developed in Aramaic-speaking Christian circles, attaching themselves to Zech. xi. 13 and the existence of this cemetery in the potter's field. The designation of Aceldama as a "potter's field" in both of the passages of the New Testament referred to connects the place with the "potter's house" mentioned by Jer. xviii. 2; xix. 2. It would appear, therefore, that Aceldama is older than the story told of it in the New Testament, and its designation as a "field of blood" is but a play upon the word, introduced to add color to the narrative of Judas Iscariot. Consult Tobler, *Topographie von Jerusalem* (1854, pp. 260 ff.); Schick in the Quarterly Statement of the *Palestine Exploration Fund* (1892, pp. 288 f.); Melander, *Jerusalems dolda tempelskatter* (1907). See HINNOM, VALLEY OF.

ACEPH'ALI (Gk. ἀ, a, priv. + κεφαλή, *kephalē*, head; i.e., headless). A name given (1) To metropolitans and bishops who have no ecclesiastical head over them. (2) To certain ecclesiastical parties: (a) those bishops at the ecumenical council of Ephesus in 431 who refused to join either the party of Cyril or of John of Antioch; (b) those who rejected the doctrinal decision of the ecumenical council held at Chalcedon in 451 upon the nature of Christ (see CHRISTOLOGY); (c) the Eutychian adherents of Peter Mongus, who refused to subscribe to the Henoticon in 482, designed to end

the Monophysite controversy. (3) To clergy belonging to no diocese. (4) To the Flagellants (q.v.).

ACEPH'ALOCYST (literally, a cyst without a head; Gk. ἀ, a, priv. + κεφαλή, *kephalē*, head + κύστις, *kystis*, a bladder, bag). An encysted larval tapeworm (*Tænia echinococcus*). See HYDATID CYST.

A'CER. See MAPLE.

ACERACEÆ, ās'è-rā'sè-ē. A family of dicotyledonous plants embracing the genera *Dipteronia* and *Acer*, with one species of the first genus in Asia and about 120 species of *Acer* in the northern hemisphere. See MAPLE.

ACERBI, ā-chēr'bè, GIUSEPPE (1773-1846). An Italian naturalist, born at Castel Goffredo. He studied at Mantua and became proficient in natural science. He was the first Italian to reach North Cape (1798). In 1816 he founded the *Biblioteca Italiana*, a literary review published at Milan, and from 1826 to 1836 was Austrian consul-general in Egypt, where he made important archæological collections for the museums of Vienna, Padua, Milan, and Pavia. He published (in English) *Travels through Sweden, Finland, Lapland* (2 vols., London, 1802).

ACERENZA, ā'chā-rān'tsā. A town in the province of Potenza, Italy, 16 miles northeast of the city of the same name. It is situated on the Bradaceo River, 2730 feet above sea level and is the seat of a bishop. The principal building is a cathedral dating from the thirteenth century, on the gable of which is a bust, supposedly of Julian the Apostate, but which is more probably a likeness of one of the Hohenstaufen. Acerenza is the Aceruntia, or Acherontia, of the late Republic and is mentioned by Horace in his poems. It was regarded as a post of great strength. The surrounding region is noted for its excellent wine. Pop., 1901, 4499; 1911, 4757.

ACERRA, ā-chēr'rā, the ancient ACERRÆ. An episcopal city in Caserta, a province of south Italy, 9 miles northeast of Naples and opposite Mount Somma, from which there is an excellent view of Vesuvius (Map: Italy, J 7). It has a cathedral and a seminary. The country is fertile, and there are sulphur and mineral springs in the vicinity. Until recently, when the marshes were drained, it was extremely unhealthy, owing to the inundations of the Agno, which is the *Clanias non æquus Acerris* of Vergil. Pop., 1901, 16,443; 1911, 16,939.

ACER'RA. An incense box used by the Romans in sacrifices; the incense, taken from the *acerra*, was burnt on the altar. More often, however, the incense was burnt in the *turibulum*, the thurible. The word *acerra* was also applied to a small altar on which incense was burnt before the dead. See INCENSE.

ACET. A combining form used in various chemical terms, and ultimately derived from Lat. *acetum*, vinegar; as in *acetal*, *acetanilid*, etc.

ACETAB'ULUM. Among the Greeks and the Romans a small, shallow vessel, properly used for holding vinegar (called, in Latin, *acetum*) or other condiments, but employed also for holding other things, such as salads, wine, or honey.

ACETAL, ās'è-tāl, CH₃CH(OC₂H₅)₂. A colorless liquid of agreeable odor and taste. It is readily obtained by heating a mixture of aldehyde and ordinary alcohol. It has been used to improve the flavor of wine. See ALDEHYDES.

ACETAMIDE, as'ēt-ām'id or -īd. See AMIDES.

ACETANILID, ās'ēt-ān'i-līd. A crystalline powder made by the action of acetic acid on aniline. It is odorless, slightly bitter, sparingly soluble in water, but freely so in alcohol, ether, and chloroform. Chemically, it is phenylacetamide, $\text{CH}_3\text{CONHC}_6\text{H}_5$. It is known also by the trade name antifebrin. Its action and uses are similar to those of antipyrine (q.v.), but the dose required is much smaller. Acetanilid is a common ingredient of "headache powders," and when taken habitually it is apt to cause serious cardiac symptoms, cyanosis of the mucous membranes, albuminuria, anæmia, œdema of the feet and ankles, heart failure, and death.

ACETATES, ās'ē-tāts. The salts of acetic acid, which are generally prepared by the action of acetic acid on metallic carbonates or hydroxides. Most acetates are soluble in water. To prove the presence of an acetate in a solution, the analytical chemist adds to the solution some strong sulphuric acid and a little alcohol and heats the mixture for a few seconds; by this treatment of an acetate solution ethyl acetic ester is produced, which is readily recognized by its pleasant and characteristic odor. Some of the acetates are: (1) *Aluminium acetate*. This has been obtained only in its aqueous solution, which is used as a mordant under the name of "red liquor." (2) The *acetate of iron*, known as "black liquor," is likewise used as a mordant in dyeing and printing cotton. The acetates of (3) lead, (4) ammonium, and (5) potassium are much used in medicine. *Lead acetate*, commonly known as "sugar of lead," is used for external applications as an astringent. *Ammonium acetate* is used to promote perspiration; it is prepared best by passing an excess of gaseous ammonia into strong acetic acid. *Potassium acetate* is very largely used as a diuretic. Other metallic acetates are mentioned under the names of the metals (q.v.).

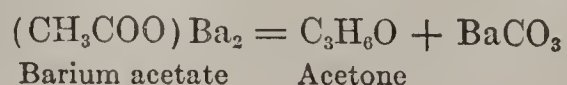
ACETIC, ā-sē'tik, **ACID**, CH_3COOH . The sour principle of vinegar, an acid composed chemically of carbon, hydrogen, and oxygen. The commercial acid is largely used in the manufacture of acetates, dye-stuffs, etc. Concentrated acetic acid burns the skin, and is therefore applied as a caustic to remove small warts and corns. Like any other acid, if taken internally for any length of time, dilute acetic acid impairs the digestion and absorption of food.

Acetic acid occurs here and there in the organic world. It is found ready formed in sweat and other animal secretions, as well as in the juices of various plants. It is manufactured either by the oxidation of ordinary alcohol through fermentation (see VINEGAR), or by the destructive distillation of wood. The aqueous product obtained in the latter process is subjected to fractional distillation, and the fraction constituting impure acetic acid (called *pyroligneous acid*) is neutralized with soda or lime. In this manner a solution of sodium or calcium acetate is obtained; this solution is evaporated to dryness, and the remaining salt is freed from water and organic impurities by heating above 400°F . Pure acetic acid is prepared by distilling the acetates thus obtained with strong sulphuric acid. The pure anhydrous acid is known as glacial acetic acid; at temperatures below 62°F . it is solid and crystalline; above that temperature it forms a colorless liquid readily known by its pungent, penetrating odor. Since carbon is one of its constituent elements,

it is, of course, classed with the compounds of organic chemistry. It is comparatively weak acid. (See ACIDS.) Besides the methods just mentioned, acetic acid can be made by synthesis from the constituent elements. When electric sparks are passed between carbon poles in an atmosphere of hydrogen, acetylene gas is produced; and when oxygen (furnished, say, by chromic acid) is made to act upon acetylene in the presence of water, the acetylene combines with oxygen and water, forming acetic acid.

ACETO-ACETIC (ās'ē-tō-ā-sē'tik) **ESTER**, $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5$. A colorless liquid organic substance obtained by the action of metallic sodium on the ester formed by the union of acetic acid and ordinary alcohol (i.e., ethyl acetic ester). Aceto-acetic ester mixes in all proportions with alcohol or with ether, but is only sparingly soluble in water. It boils at 180°C . One of the two hydrogen atoms of its CH_2 group is readily replaced by sodium, and the resulting compound, in turn, readily reacts with the halogen substitution products of the fatty hydrocarbons, such as CH_3I , $\text{C}_2\text{H}_5\text{I}$, etc. The result is the production of such derivations of aceto-acetic ester as $\text{CH}_3\text{COCH}(\text{CH}_3)\text{COOC}_2\text{H}_5$, $\text{CH}_3\text{COCH}(\text{C}_2\text{H}_5)\text{COOC}_2\text{H}_5$, etc. In these, the hydrogen of the CH group can again be replaced by sodium, and the resulting compounds can again react with CH_3I , $\text{C}_2\text{H}_5\text{I}$, and similar substances. This time the result is a series of *di*-substitution derivatives of aceto-acetic ester. Now, aceto-acetic ester itself and its *mono*- and *di*-substitution products are split by the action of potassium hydroxide, and that in two distinct ways, depending on the strength of the alkali used: aceto-acetic ester will yield either acetic acid or acetone and, similarly, the *mono*- and *di*-substitution products of aceto-acetic ester will yield *mono*- and *di*-substitution products of either acetic acid or acetone. In this manner a great number of acids and ketones have been synthesized with the aid of aceto-acetic ester, whence the great importance of this substance in organic chemistry. Aceto-acetic ester further reacts with aldehydes, with aldehyde-ammonia, phenyl-hydrazine, aniline, and other substances, the result being a further series of valuable syntheses. See MALONIC ESTER.

ACETONE, ās'ē-tōn, or DIMETHYL KETONE, CH_3COCH_3 . A colorless organic liquid boiling at $56^\circ.3\text{C}$., and having at 20° a specific gravity of 0.792. It is volatile and inflammable, has a pleasant ethereal odor, dissolves various organic substances such as fats and resins, and mixes in all proportions with water, alcohol, and ether. It is separated from its aqueous solutions by calcium chloride. It dissolves considerable quantities of acetylene gas (q.v.), and absorbs a very large amount of sulphurous anhydride. It is used as a solvent as well as for the manufacture of chloroform, iodoform, etc. Acetone is produced when various organic substances are subjected to destructive distillation; it is thus found in pyroligneous spirit (see METHYL ALCOHOL) obtained by the dry distillation of wood. It is separated from wood spirit by distilling over calcium chloride. It is usually prepared by distilling barium acetate at a moderate heat, according to the following chemical equation:



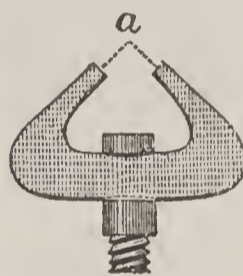
The somewhat impure product obtained either from wood spirit or from barium acetate may be readily purified and dehydrated by the use of the acid sulphite of sodium, with which it combines to form a crystalline solid compound. Pure acetone is obtained from the latter by distilling with sodium carbonate. When acted on by chlorine in the presence of alkali, acetone is converted into chloroform. Iodoform is similarly produced by the action of iodine (in ammonium iodide solution) and ammonia upon acetone, the reaction forming the most sensitive test for acetone that is known to chemists. The action of acids transforms acetone into mesityl oxide $\text{CH}_3\text{COCH}:\text{C}(\text{CH}_3)_2$, phorone, and isophorone, by "condensation," or dehydration. When acetone is distilled with strong sulphuric acid, mesitylene is produced; this reaction has been of great value in determining the chemical constitution of a vast number of benzene derivatives allied to mesitylene. Acetone occurs in small quantities in the blood, and is present in the liquid passing over when urine is distilled. It has long been known to chemists as a product of distillation of acetates; its composition was first determined by Liebig and Dumas in 1832. See KETONES.

ACETYL, äs'ë-tîl, CH_3CO . A univalent atomic group or radicle in organic chemistry. See CARBON COMPOUNDS.

ACETYLENE (from *acetyl*), $\text{HC}\equiv\text{CH}$. A colorless gas composed chemically of carbon and hydrogen. It is present in small quantities in ordinary illuminating gas and has a characteristic disagreeable odor somewhat resembling that of garlic. Its "critical temperature" is 37°C . (about 98.6°F .); that is to say, no matter how great the pressure to which it may be subjected above 37° it will remain gaseous, while at 37° a certain pressure, called the "critical pressure," is necessary and sufficient to liquefy it; the critical pressure of acetylene is 68 atmospheres. Acetylene burns with a brilliant flame and is used as an illuminant. It is best made for scientific as well as for industrial purposes by the action of water on the carbide of calcium (q.v.). It is thus produced, for instance, in automobile lamps. The various apparatus devised for the manufacture of acetylene produces it either in the gaseous state or, by immediate compression, in the liquefied state. We will distinguish two types of apparatus. In the first the *carbide is contained in an appropriate reservoir, into which water is introduced at a required rate*. Such apparatus is rather inconvenient and somewhat dangerous, for the reason that in the mass of carbide considerable rise of temperature may occur at the point immediately attacked by water; besides, a crust of lime may form on the surface of a lump of carbide, and when the water at last penetrates to the core of the lump a sudden and more or less violent reaction may ensue; all of which would naturally result in uneven generation of gas, variations of pressure, and, perhaps, the explosive inflammation of the gas. In the second type of apparatus, on the contrary, the *carbide is thrown into a considerable mass of water*, whereby undue elevations of temperature and irregularity of action are completely avoided. As the presence of impurities in acetylene adds considerably to the danger of using the gas, various methods of purification have been proposed. Now, the nature and quantity of im-

purity in acetylene depend entirely on the composition of the carbide used in its manufacture, and a very pure acetylene has been produced on quite a large scale simply by employing a pure carbide. With air or oxygen acetylene forms extremely explosive mixtures; mere external friction of a vessel in which such a mixture is contained may cause an explosion. But acetylene is explosive even when isolated and pure, if kept *under pressure of more than two atmospheres*; and it is very dangerous indeed when preserved in liquid form. It has, instead, been stored in solution in ordinary acetone, which absorbs considerable quantities of it. If the pressure under which the gas is dissolved in acetone is not very great, explosion can occur only in the gaseous volume above the surface of the liquid; the dissolved portion of the gas does not take part in the explosion. Under any circumstances, sudden compression of a volume of acetylene may cause an explosion. Acetylene is slightly, if at all, poisonous; it is certainly much less poisonous than ordinary illuminating gas.

Acetylene contains a high percentage of carbon, and the amount of heat generated in its combustion is very large. These are the causes to which its high illuminating power is due; for, in order that a flame may be luminous, it must contain a large amount of carbon particles, and its temperature must be high enough to keep those particles in a state of incandescence. In order that acetylene may yield a large amount of light, it must be properly burned. The numerous burners devised for this purpose are constructed with a view to burning either pure acetylene or mixtures of acetylene and other gases, such as nitrogen, carbonic acid gas, and especially marsh gas. We reproduce here the Perrodil burner,



which, while adapted for use with pure acetylene, allows it to be sufficiently mixed with air before it reaches the point *a*, where it begins to burn.

Acetylene is one of the cheapest illuminants. It has, besides, the important advantage over other illuminants of being easily produced and requiring no special establishment for its manufacture.

In the opinion of eminent experts, the danger connected with storing it even in large quantities is not great enough to justify a verdict against its introduction into common use.

We will mention a few other uses to which acetylene may be applied:

1. If calcium carbide were cheaper, acetylene might be used as an enricher; i.e., to increase the illuminating power of coal gas and of other combustible gases.

2. When acetylene is passed into an alkaline solution of iodine, the substance *di-iodoform* (C_2I_4) is produced. This substance possesses the antiseptic properties of ordinary iodoform without having the strong and annoying odor of that substance. Di-iodoform has been manufactured on an industrial scale.

3. Under the influence of electric sparks acetylene combines directly with nitrogen to form *prussic* (hydrocyanic) *acid*. It might, therefore, be used in the cyanide industry.

4. A process has been patented in Germany for the manufacture of *sugar* from acetylene.

5. When heated with hydrogen, acetylene is converted into ethylene, and by the action of sulphuric acid and water the latter yields ordinary *alcohol*. It has been argued that if pure alcohol, manufactured by this method, could be substituted as an article of commerce for the highly toxic liquors so freely sold at the present day, a great deal would be accomplished toward diminishing the evil of alcoholism. Under the present conditions, however, the process would be too expensive.

Chemically, acetylene is an unsaturated compound, the first of an important series of hydrocarbons. It is said to be "unsaturated" because it combines with bromine and the other halogens without at the same time losing any of its own elements. It combines in a similar manner with hydrogen. By heating a mixture of acetylene and hydrogen, ethylene gas may be obtained, and this can be further transformed into ethane gas by the action of hydrogen in the presence of "platinum black" (finely divided platinum). Berthelot effected the interesting synthesis of acetylene by passing electric sparks between carbon poles placed in a vessel filled with hydrogen. Under such conditions the carbon of the poles combines directly with hydrogen to form acetylene.

In conclusion, another important property of acetylene may be mentioned. When acetylene is passed into a solution of a cuprous salt (say, cuprous chloride), containing some ammonia, a curious and characteristic compound of acetylene and copper is obtained, called *copper acetylide*. When a chemist is called upon to determine whether acetylene is present or absent in a given mixture, he tests it with a solution of cuprous chloride containing some ammonia; the formation of copper acetylide proves the presence of acetylene. It is currently believed that the explosive compound of copper and acetylene will form whenever acetylene comes in contact with metallic copper or its alloys. This idea has, however, been proved positively false; there is no danger whatever in storing acetylene in metallic vessels of any kind.

Consult: V. B. Lewes, *Acetylene: a Handbook for the Student and Manufacturer* (New York, 1900); Caro, Ludwig, and Vogel, *Handbuch für Azetylen in technische und wissenschaftlicher Hinsicht* (Braunschweig, 1904); Scheel, *Das Azetylen* (Hanover, 1907); Holbeger, Betke, and Nolte, *Azetylen und seine technische Verwendung* (Berlin, 1909); Leeds and Butterfield, *Acetylene* (Philadelphia, 1910); Vogel, *Das Azetylen* (Leipzig, 1911). A technical journal devoted to the acetylene industry (*Zeitschrift für Calciumcarbid-Fabrikation und Azetylen-Beleuchtung*) was established at Suhl in 1897 and has, since 1900, been published at Berlin.

ACHÆA, à-kē'á (Gk. Ἀχαια). 1. The south-east part of Thessaly, the legendary home of Achilles (q.v.). 2. The northern part of Peloponnesus, bordering on the Corinthian Gulf. The land, which rises gradually from the coast to the hills of the interior, was famed in ancient times for fertility in production of oil, wine, and fruits; the wooded mountains contained much game. In the modern kingdom of Greece Achæa forms a nome, or department, in the extreme northwest of the Morea, and its chief town is Patras (ancient Patræ). Except the west coast, the land is fertile and produces grain, wine, and oil.

In early times the Achæans (q.v.) held more or less aloof from participation in the affairs of the rest of Greece. There were 12 principal towns, the names of which, according to Herodotus, were Pellene, Ægeira, Ægæ, Bura, Helice, Ægium, Rhypes, Patræ, Pharæ, Olenus, Dyme, and Tritæa; they formed a confederacy, with Helice at the head. After the destruction of Helice by an earthquake in 373 B.C., Ægium took its place as the chief city of the confederacy. The wars and rivalries which prevailed after the death of Alexander the Great brought about the complete dissolution of the ancient bond, but a new union was formed in 280 B.C., which gradually extended itself, and in a few years comprised 10 cities, Patræ, Dyme, Pharæ, Tritæa, Leontium, Ægeira, Pellene, Ægium, Bura, and Ceryneia. This second confederacy was known as the Achæan League. It first came into prominence as an important factor in Greek and Hellenic politics in 249 B.C., when Aratus (q.v.) joined thereto his native city, Sicyon. The aim of the league from this time was to free the Greek peninsula from Macedonian rule. In 242 B.C. the Macedonian garrison was driven from Corinth, and this city was brought into the confederacy. Before the last quarter of that century the league had reached its most flourishing period of development. It included the whole of northern and middle Peloponnesus except Sparta, and many cities in other parts of Greece.

The government of the league affords perhaps the best example in antiquity of the federal system. In foreign affairs the league acted as a whole, but in internal affairs each city was a unit, and had equal rights with every other city. Also, each state still preserved its entire independence. There was a public assembly which met regularly twice every year, in spring and in autumn, and was attended, not by deputies, but in person by all male citizens of thirty years of age or over. The vote was by states, each state having voting strength according to its population. The meeting-place of the assembly was at first a grove near Ægium, but later Philopœmen (q.v.) instituted a change, whereby meetings were to be held in rotation at the various cities belonging to the league. In this council the affairs of the league were brought up to be discussed and passed upon, and a record was kept of the proceedings. The chief officer of the league was the *strategos*, who had as subordinates a *hipparchos*, the commander of the cavalry, and a *nauarchos*, the admiral. There was also a secretary. The *strategos* was commander-in-chief of the army and general executive officer. He was assisted in the duty of calling together the assembly and presiding thereat by a board of ten *demiurgi*. For some years the league maintained its independence against all enemies. Something of the old power of Greece seemed to return, and there was a promise of permanent union; but it soon appeared that the league was bent on its own destruction. Instead of presenting a firm front against the common foes of Greece, its members were divided by continual discords. The Ætolian League was a formidable rival (see ÆTOLIA), and the Spartans, led by King Cleomenes III, pressed the confederacy so hard that Aratus was finally compelled to seek the alliance of the Macedonian King, Antigonus Doseon.

This act was nothing less than the beginning of the dependency of the Achæan League on the Macedonian power. Another dangerous enemy was Rome. Led by the wise and energetic policy of Philopœmen, the Achæans held out against enemies at home and abroad for a number of years, but in 198 B.C. they were induced to ally themselves with the Romans. In 192 B.C. Philopœmen appeared at Sparta and compelled that city to join the league, and by the following year the whole of Peloponnesus had come over to the union. This situation, however, lasted but a short time. The hostilities of Sparta, the intrigues of the Romans, and internal dissensions combined to bring about the fall of the confederacy. In 167 B.C. a wholesale deportation of leading Achæans to Rome as hostages took place. In 146 B.C. the Achæans were defeated at Corinth by the Roman general Mummius (q.v.). This defeat not only dissolved the league, but destroyed the political independence of Greece. Southern and central Greece, under the name of Achæa, became a Roman province. Polybius (q.v.), who was one of the Achæans taken to Rome as hostages in 167 B.C., has given an extended account of the league in his history of the period between 220 B.C. and 146 B.C. Consult: Schorn, *Geschichte Griechenlands von der Entstehung ætolischen und achæischen Bundes* (Bonn, 1833); Drumann, *Ideen zur Geschichte des Verfalls der griechischen Staaten* (Berlin, 1811); Hertzberg, *Geschichte Griechenlands unter den Römern* (Halle, 1875); and Freeman, *History of Federal Government* (2d ed., London, 1893).

3. Under the Romans the province containing all Greece except Thessaly and Macedonia.

ACHÆAN LEAGUE. See ACHÆA.

ACHÆANS, ä-kē'anz (Gk. Ἀχαιοί, *Achaiōi*). One of the races of ancient Greece. In Homer the name sometimes includes all the Greeks. The Achæans inhabited the southeastern part of Thessaly and much of the Peloponnesus. By the Dorian invasion they were crowded into the northwestern corner of the Peloponnesus, where they later formed the Achæan League. (See ACHÆA.) In mythology their ancestor was Achæus, son of Xuthus and grandson of Hellen (q.v.).

ACHÆMENES, ä-kēm'ê-nēz (Gk. Ἀχαιμένης, *Achaimenēs*), **ACHÆMENIDÆ.** The names respectively of the progenitor and of the dynasty of ancient Persian kings, Cyrus, Cambyses, Darius, Xerxes, Artaxerxes, and their successors. The rule of the Achæmenidæ over Iran lasted 558–330 B.C. In the old Persian inscriptions Darius proudly traces his lineage back to *Haxāmanisiya* (in Greek, Ἀχαιμένης), as the founder of the royal line, and states that from him the family received the name Achæmenidæ.

ACHAGUA, ä-chä'gwä. An Indian tribe of Arawakan stock, which formerly inhabited the forests of the upper Orinoco region in northeastern Colombia. They were prominently mentioned in the last century, but were entirely uncivilized, practicing tattooing, polyandry, and the destruction of female infants. About 500 were said still to exist on the Rio Muco about the year 1850.

ACHAIA, ä-kä'yä, mod. Gr. pron. ä-kä'a. See ACHÆA.

ACHAMOTH, äk'ä-möth. In the theological system of Valentinus (q.v.) the Gnostic, a personification of a form of wisdom inferior to the

pure *sophia*. She is the mother of the world-maker, Demiurge. See DEMIURGE.

ACHARD, äk'ürt, FRANZ KARL (1753–1821). A German physicist and chemist, born in Berlin. He is remembered chiefly as the founder of the beet-sugar industry. He devoted several years to investigating the best methods of raising sugar-beets and of producing sugar on an industrial scale. Finally, at the instance of the King of Prussia, experiments were successfully carried out in Berlin about 1800, and as a result Achard was enabled to establish near Kunern in 1801 the first sugar manufactory. He wrote *Die europäische Zuckerfabrikation aus Runkelrüben in Verbindung mit der Bereitung des Branntweins* (1812). Achard was for a time director of the class of physics in the Berlin Academy of Sciences, and published four volumes of *Vorlesungen über Experimentalphysik* (1790–92).

ACHARD, ä'shär', LOUIS AMÉDÉE EUGÈNE (1814–75). A French novelist, born in Marseilles, where he was at first a merchant. He entered newspaper work in his native city, continued it in Paris, went as a reporter to Spain with the Duc de Montpensier in 1846, and followed the French armies in 1870. He is chiefly known as a novelist, his romances being numerous. Among them are *La belle rose* (1847); *Les misères d'un millionnaire* (1861); and *Histoire d'un homme* (1863). He also wrote several plays, among them *Histoire de mes amis* (1874).

ACHARNIANS, ä-kär'nī-anz, THE (Gk. Ἀχαρνείς, *Acharneis*). A comedy of Aristophanes (q.v.) produced in Athens at the festival of the Lenæa, 425 B.C., under the name of *Callistratus*. The title comes from the fact that the chorus is composed of men of Acharnæ, an Attic deme near Mount Parnes. The play is in opposition to the democratic policy of war with Sparta. Dicæopolis, the hero, is an honest farmer who is tired of the fighting and his losses thereby and finally makes a private treaty with the Lacedæmonians. This leads to a farcical but brilliant display of the contrasts between the discomforts of war and the joys of peace. The play has been well edited, with translation, by Starkie (London, 1909); there is an admirable translation by John Hookham Frere.

ACHATES, ä-kä'tēz (modern Dirillo). 1. A river in southern Sicily that gave its name to the agate (*achates*) which was found there, according to Pliny (37, 139). 2. A faithful companion of Æneas in his wanderings (Vergil, *Æneid*, i, 188, etc.), called by Vergil *fidus Achates*. The name *fidus Achates* has long been applied to any faithful friend.

ACHELOUS, äk'ê-lō'ūs (Gk. Ἀχελῷος, *Achelōos*, now called Aspropotamos, i.e., White River, from the cream color of its waters). The largest river in Greece (Map: Greece, C 5). It rises in Mount Peristeri of the Pindus range, flows southward, separating the modern *eparchiæ* Artta and Báltos on the west from Tríkala and Evrytania on the east, and falls into the Ionian Sea. It is over 100 miles long and unnavigable.

ACHENBACH, äk'en-bak. The name of the two most celebrated landscape painters of the Düsseldorf School (q.v.).—ANDREAS (1815–1910), the elder, was born at Cassel and studied at Düsseldorf with Schadow and Schirmer. His art represents a realistic reaction upon the romanticism of the Romantic School and was influenced

by the Dutch. Although he traveled much and painted every variety of landscape, he is particularly known as the painter of the northern ocean. His vision was clear and sober, but he lacked appreciation of the sentiment in nature. His principal works include "The Sinking of the President" (Karlsruhe), "Hardanger Fjord" (Düsseldorf), "The Pontine Marshes" (Munich), and "The Fish Market at Ostend" (1866, Berlin). His works are numerous in all important German and many American galleries, such as the Metropolitan Museum, New York, and in the Pennsylvania Academy at Philadelphia.—OSWALD (1827–1905) was born at Düsseldorf. His journey to Italy in 1850–51 determined the character of his subjects, which are Roman and south Italian, representing some folk scene as part of a brilliantly colored landscape. His style is more romantic than his brother's, but less powerful. His principal works include "A Funeral at Night in Palestrina" (1859, Düsseldorf), the "Gulf of Naples," and other subjects (1880, Dresden). His paintings are also numerous in the United States, and he was represented at the World's Fair in St. Louis by "Sea at Sunrise," "The Arch of Constantine," and "Lake Nemi." Consult C. Achenbach, *Andreas Achenbach in Kunst und Leben* (Cologne, 1912).

ACHENE, à-kên', also ACHENIUM and AKENE (Gk. *â*, *a*, priv. + *χαλιν*, *chainein*, to gape). A seed-like fruit such as is characteristic of the great family of Compositæ, to which belong sunflowers, thistles, dandelions, etc. The pits of the strawberry and the small fruits forming a head in the centre of a buttercup are also achenes. The seed-like appearance arises from the fact that the wall of the seed-vessel hardens and invests the solitary seed so closely as to seem like an outer coat. See FRUIT.

ACHENSEE, äg'en-zä. A lake in north Tyrol, Austria, 20 miles northeast of Innsbruck. It is 5½ miles long and half a mile broad and is 3018 feet above sea level. Its picturesque shores dotted with hotels and villas are much frequented as summer resorts. Steamers ply on its waters.

ACHENWALL, äk'en-väl, GOTTFRIED (1719–72). One of the most influential German economic and political scientists of the eighteenth century. Besides works on natural law, history, and political science, he was author of an important treatise entitled *Staatsverfassung der heutigen vornehmsten Europäischen Reiche* (1752), in which he treated not only the political constitutions, but the economic and social condition of the principal nations. His method was statistical, and the effect of his work was to popularize the use of statistics in Germany. Certain of his disciples claimed for him the title of founder of statistical science; but such a claim cannot be defended in view of the priority of Petty, Conring, and other writers in the use of this method.

ACHERON, äk'ë-rön (Gk. *Ἀχέρων*, *Acherōn*). The name given by the ancients to several rivers. The best known is the Acheron in Thesprotis, in Epirus, which flows through the lake Acherusia and pours itself into the Ionian Sea. According to Pausanias (q.v.), Homer borrowed from this river the name of the river Acheron in the underworld. In the later poets and mythographers Acheron is the name of a river or lake in the lower world across which the souls of the dead were obliged to pass. (See STRYX.) The lake Acherusia in Thesprotis was regarded

as an entrance to the lower world, and the name was also applied to a walled inclosure near a temple at Hermione in Argolis, in the Peloponnesus, and a promontory near Heracleia in Pontus, Asia Minor.

ACHESON, äch'e-son, EDWARD GOODRICH (1856–). An American chemical inventor. He was born at Washington, Pa., and received only an elementary education. At the age of sixteen he was compelled to seek employment as time-keeper at a blast furnace; yet the very next year he invented a usable drilling machine. Subsequently he found routine employment in the petroleum industry and in ore mining. In 1880 he became Thomas A. Edison's assistant, taking part in the development of the incandescent lamp, and in 1881–82 installed the first lamp plants in Europe. In 1891 he invented the now widely used abrasive *carborundum*, a carbide of silicon, and between 1895 and 1899 he worked out a process for making artificially a graphite ("Acheson-graphite") that far surpasses the natural product in purity and industrial usefulness. In 1906 and 1907 he succeeded in reducing his graphite to an exceedingly fine state of subdivision ("deflocculating" it), in which state it remains permanently suspended in water ("Aquadag") or in oil ("Oildag"). These suspensions possess great practical value as lubricants. The honors bestowed upon Acheson in recognition of his services to art and industry include the Rumford Medal of the American Academy and the Perkin Medal for the most valuable work in applied chemistry. In 1909 the University of Pittsburgh conferred upon him the honorary degree of Doctor of Science, and in 1913 he was made an honorary member of the Imperial Technological Society of Russia.

A CHEVAL (à'she-väl') **POSITION** (Fr. *à cheval*, on horseback). A military term to denote the position of an army astride a river or other obstacle preventing effective coöperation of the wings of the army. When the perpendicular to the front is formed by a river, possession of bridges is necessary in order to provide communication for supporting troops.

ACHIKAR, à-chë'kär. The hero of a romance widely read in antiquity. He is represented as a wise wazir of the Assyrian kings Sennacherib and Esarhaddon. Through the intrigues of his ungrateful nephew Nadan, whom he has brought up, he is condemned to death, but is saved by the executioner, who substitutes for him a eunuch, and after some time, when Nadan's crime is found out, restored to his position. The culprit is left to the mercies of Achikar, who only keeps him in confinement, treating him daily to wise counsels until he dies. The sayings of Achikar occupy a large part of the work. The earliest form of the story is found in papyrus fragments coming from the archives of the Jewish military colony in Elephantine. (See ELEPHANTINE PAPYRI.) This copy of the text was written about 407 B.C. in Aramaic, which probably was the original language. It is very defective. When the story was first written is not known; but it is supposed to go back to the beginning of the fifth century. It is of great interest in showing how early stories of this kind began to cluster about the later monarchs of Assyria and how gnomic literature in such a fictitious setting of pagan origin was cherished among the Jews. Before this remarkable discovery the story was generally thought to have been written either about 200 B.C. just before the

Book of Tobit, in which Achikar, or Achiacarus, is mentioned (i. 21, 22; ii. 10; xi. 18; xiv. 10, 11), or some time later to satisfy curiosity in regard to this personage. The Arabic version, which was first made known through a translation in Chavis-Cazotte, *La suite des mille et une nuits*, ii, 1788, was derived from the Syriac, and this, like the Ethiopic, Armenian, Slavonic, and Rumanian, from the Greek, of which some parts remain. A Greek translation may have been known already to Theophrastus (300 B.C.), who, according to Diogenes Laertius (v, 50) wrote a book called *Achikaros*, and to Posidonius (c.100 B.C.) in Strabo, xvi, 2, 39. A pictorial representation of Achikar is found in a mosaic at Treves. Consult: Sachau, *Aramäische Papyri und Ostraka* (1911, pp. 146 ff.); Conybeare, R. Harris, and Agnes Lewis, *The Story of Achikar* (1898); Smend, *Alter und Herkunft des Achikar-Romans* (1908); F. Nau, *Histoire et Sagesse d'Achikar l'Assyrien* (1909); Ed. Meyer, *Der Papyrusfund von Elephantine* (1912).

ACHILL, äk'il, or **EAGLE ISLE**. An island off the west coast of Ireland, in the county of Mayo. It is about 20 miles long and has a mean breadth of about 4 miles. It has several mountains composed of mica slate, about 2000 feet high. There are several villages. Pop., 1911, 1721.

ACHILLEA, äk'il-lë'ä (Lat. *achillëos*, milfoil, yarrow, whose "virtues" are said to have been discovered by Achilles). A genus of over 100 species belonging to the family Compositæ. Most of the species belong to the Old World, only four or five species occurring in North America. The common yarrow or milfoil (*Achillea millefolium*) is a very cosmopolitan species, occurring throughout the northern hemisphere. The flat-topped cluster of white flowers with stiff branches, the finely dissected leaves, and the bitterish aromatic taste and odor make this species easily recognizable. Both leaves and flowers are used in medicine as a powerful stimulant and tonic. The leaves were formerly much used for healing wounds, and are still so employed by the common people in the Highlands of Scotland and in some parts of the Continent of Europe. Such old names as "sanguinary," "nosebleed," and "soldier's-woundwort," suggest the uses to which the plant was put. The expressed juice is a popular spring medicine in Germany. *Achillea moschata*, called musk milfoil, is cultivated as food for cattle in Switzerland. *Achillea moschata*, *atrata*, and *nana*—all natives of the Alps—are very aromatic, and bear the name of genipi or genip. The inhabitants of the Alps value them very highly, and use them for making what is called Swiss tea. *Achillea nana* is said to be used in making chartreuse. Sneezewort (*Achillea ptarmica*) is a native of Europe, and somewhat introduced into the United States, with lanceolate leaves and much larger flowers than the common milfoil. The root, which is aromatic, is used as a substitute for pellitory of Spain, and is often called European pellitory.

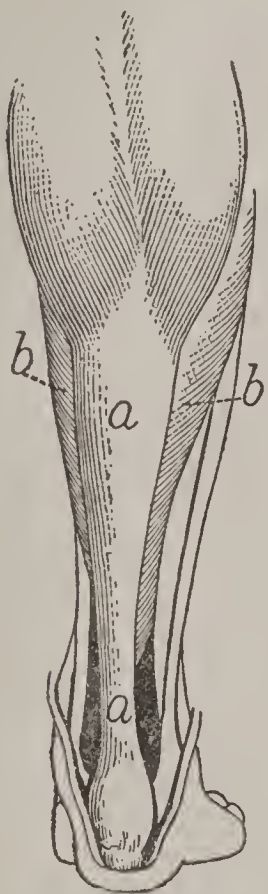
ACHILLES, ä-kil'lëz (Gk. Ἀχιλλεύς, *Achilleus*). The hero of Homer's *Iliad*, and the type of glorious youth. In the Homeric poems his story is simple. The son of King Peleus and the sea-goddess Thetis, he was brought up at his father's court in Phthia, in Thessaly, Greece, until he was induced to take part in the Trojan War; when he learned that he could have either a long but inglorious life or a short and

famous career, he preferred an early death with fame. This fate gives Achilles a tinge of melancholy characteristic of the Greek mind. While the Greeks were in camp before Troy, Achilles plundered the surrounding country and secured as his booty the beautiful maiden Briseïs. The *Iliad* narrates the wrath of Achilles because Agamemnon deprived him of Briseïs, whom he had come to love, to replace Chryseïs, whom Agamemnon had been forced to restore to her father Chryses, priest of Apollo, to avert the wrath of Apollo from the Greeks. In the absence of Achilles, who in his rage refuses to fight longer for the Greeks, the Trojans drive the Greeks to their ships; the complete destruction of the Greeks is averted only when Achilles allows his friend Patroclus to lead his Myrmidons to the rescue. Pursuing the Trojans to their walls, Patroclus is slain by Hector, and Achilles, overwhelmed with grief, becomes reconciled with Agamemnon, that he may hasten to obtain revenge. He returns to the fight, and after driving the Trojans within the city, slays Hector and drags his body to the ships. After celebrating the funeral of Patroclus with great pomp, he yields to the command of Zeus and allows Priam to ransom the body of his son Hector. In the *Odyssey* we have allusions to the death of Achilles, his splendid burial, and the renown of his son Neoptolemus. Later epic poems and other compositions add many details. According to some, his mother renders him invulnerable by dipping him in the river Styx; but his heel, by which she held him, was not immersed, and here he received his death wound from an arrow. He was educated by the centaur Chiron, and was afterward hidden, robed as a girl, by his mother at Scyros, among the daughters of Lycomedes, that he might escape the temptation to join the expedition against Troy. He was needed, however, in the expedition, and was detected by the craft of Odysseus, who, disguised as a peddler, offered a sword, as well as trinkets, for sale to the maidens. When a trumpet suddenly sounded a call to arms, Achilles at once seized the sword and, being recognized, was then easily induced to join the Greeks (Ovid, *Metamorphoses*, vol. xiii, 162 ff.; Statius, *Achilleis*, vol. i, 207 ff.). His combats with Penthesilea, Queen of the Amazons, and with Memnon (q.v.), who came to aid Priam after the death of Hector, were favorite subjects with Greek artists. He met his death at the hands of Apollo and Paris before the Scæan gate, or in the temple of Apollo, whither he had gone to meet Polyxena, daughter of Priam, whom he was to wed. To appease his spirit she was slaughtered on his grave after the capture of Troy. After his death he was transported to the Islands of the Blessed, where he was united with Medea. Achilles was worshiped in Laconia and other parts of Greece, and it is probable that, like other Greek heroes, he was originally a god, honored especially by the Achæans of Phthiotis. See HOMER; TROJAN WAR.

ACHILLES TATIUS, tä'shī-üs (Gk. Ἀχιλλεύς Τάτιος, *Achilleus Tattios*). A Greek writer, a native of Alexandria, who lived probably in the fifth or sixth century A.D. He was the author of a romance in eight books, entitled *The History of Leucippe and Clitophon*, in which he borrowed freely from the work of his predecessor Heliodorus (q.v.), by whom alone he

was surpassed in popularity. While his work is graceful in style, it is inferior to that of his model; for us it is marred in passages by the grossest pagan immorality. It was, however, freely imitated by later writers, especially by Eustathius and Nicetes Eugenianus in the Byzantine period. Suidas says that the author became a Christian and gained the office of bishop, but this is doubtful. The work has been edited with commentary by Jacobs (Leipzig, 1821); Hirschig, in Didot's *Scriptores Erotici* (Paris, 1856); Hercher (Leipzig, 1858). Consult Salverte, *Le Roman dans la Grèce ancienne* (Paris, 1894); Rohde, *Der griechische Roman und seine Vorläufer* (Leipzig, 1900) and Wolff, *The Greek Romances in English Prose Fiction* (New York, 1912).

ACHILLES TEN'DON (Lat. *Tendo Achillis*). A tendon (*a*) which attaches the soleus



ACHILLES TENDON.

(*b*) and gastrocnemius muscles of the calf of the leg to the heel bone. It is estimated to be capable of resisting a force equal to 1000 pounds weight, and yet is occasionally ruptured by the sudden and violent contraction of these muscles. The name was given with reference to the death of Achilles by a wound in the heel.

ACHIMENES, á-kím'è-nēz (probably from Lat. *Achæmenis*, Gk. ἀχαιμενίς, *achaimenis*, an amber-colored plant in India used in magical arts). A genus of plants of the family Gesneraceæ (q.v.), much grown in pots in greenhouses. The species are numerous—natives of tropical America. Achimenes is propagated either by the natural increase of the

rhizome or by cuttings. If the rhizomes are potted by April 1, the drooping plant comes into blossom by the last of May and continues to bloom without cessation for four or five months. After growth starts the soil should never be allowed to become dry. The corolla tube is cylindrical, and the limbs are spreading. The blossoms are red, blue, and white, with all intermediate shades.

ACHIN, á-chēn', or **ATCHEEN**. The Dutch Atjeh, a dependency at the north end of Sumatra, about 20,000 square miles in area, with a population which numbered approximately 580,000 in 1905. The country is mountainous, being intersected by the northwest-southeast trending ranges which form the axis of Sumatra, some peaks attaining 12,000 feet. The famous Gold Mountain, 5660 feet high, is at the extreme northern point, overtowering the city of Kotaraja or Achin, the seat of the Dutch government. For the geography of the southern part of the dependency, consult W. Volz, *Nord-Sumatra* (vol. ii); *Die Gajoländer* (Berlin, 1912).

The shorter stature, darker color, etc. of the aborigines of Achin has led some authorities to separate them from the Sumatrans in general, and their language is by others held to be at bottom Polynesian rather than Malay.

While undoubtedly Malays, the Achinese, like several other peoples of the East Indies, may have a strain of Arab blood. In the seventh century the Hindu missionaries introduced civilization, and many emigrants from India settled here. In the thirteenth century the people were converted to the faith of Islam, the sultans of Achin claiming descent from the first Mohammedan missionary. When in the sixteenth century Europeans reached Achin, they found astonishing wealth. The Achinese sent an embassy to the powerful Dutch republic, and the envoys had audience of Prince Maurice in his camp before Grave in 1602. The Dutch kept up intermittent trade intercourse with them. In 1819 they concluded with the government of India a treaty which excluded from residence in Achin Europeans other than British. When in 1824 the British settlements in Sumatra were ceded to the Dutch, Great Britain stipulated that the Dutch should not conquer the little kingdom. The piratical instincts of the Achinese, however, led them into conflicts with the Dutch, who found it necessary to chastise them. In 1871, by the Hague Treaty, the British withdrew their reservation, and the Dutch sent an expedition in 1873 to capture the chief city and invade the country. They were beaten in this, as well as in other expeditions, and the country was not pacified until 1880, when a civil government was instituted. Outbreaks resulting in serious fighting occurred in 1896, 1898, and 1901-04. The Achin wars have cost the Netherlands 12,000 lives and nearly \$100,000,000 for blockade and naval and military operations, and the country is yet practically unsubdued in the interior. There are numerous works in Dutch treating of Achin, and there are in Holland many monuments and trophies of the war. Besides the historical work of Veth, *Atchin* (Leyden, 1873), the standard treatise on the Achinese is that of Christiaan Snouck-Hurgronje, *De Atjehers* (2 vols., Batavia, 1893-95).

ACHISH, ā'kīsh. A Philistine king of Gath, son of Maoch (1 Sam. xxvii. 2). When David fled from Saul, he took his refuge with Achish and became his vassal, receiving from him Ziklag in fief. Unwilling to fight against Judæans, Jerahmeelites, and Kenites, David made raids upon the Geshurites, Girzites, and Amalekites, while persuading Achish that he had been fighting the former tribes. Achish stood by his vassal when the Philistine confederacy began the war against Saul which ended with the battle of Mount Gilboa; but the other princes distrusted David and refused to have him take part in the expedition. The story in 1 Sam. xxi. 10-15 that David feigned madness when he first appeared before Achish is evidently out of place in the present context, but such a ruse is not impossible. The editor of Ps. xxiv. believed the story, but, thinking of Gen. xx. 2, wrote by mistake Abimelech for Achish. The name itself is of interest, as it is one of the few non-Semitic Philistine names that have been preserved.

ACHMET, äk'mët. See AHMED.

ACHMET, äk'mët, or **AHMED**, ä'mëd. The name of three sultans of Turkey, of whom Achmet III (reigned 1703-30) was the most famous. It was this sovereign who sheltered Charles XII after his defeat at Pultowa in 1709. He wrested the Morea from the Venetians in 1715. Having invaded Hungary, he was de-

feated by Prince Eugene at Peterwardein in 1716, and later near Belgrade, and compelled to cede to Austria, by the treaty of Passarowitz, 1718, Belgrade, the Banat, and other territories. The soldiers drove him from the throne in 1730, and he died in prison in 1736.

ACHOMAWI, ä'chō-mä'wë. A Shastan tribe in California. See SHASTA INDIANS.

ACHOR, ā'kōr. A valley which forms the northern boundary of Judah (Josh. xv. 7) near Jericho. Its identification is uncertain, though Wady-el-Kelt has been suggested, which, however, is not broad enough to become "a place for the herds to lie down in" (Isa. lxxv. 10).

ACHORION, ä-kō'rī-ōn. See FAVUS.

ACHRAS, äk'räs. See BLACK BULLY.

ACHROMATIC, äk'rō-mät'ik. See TELESCOPE.

ACHRO'MATISM (colorlessness, from Gk. *ἀ*, *a*, priv. + *χρῶμα*, *chrōma*, color). The property by virtue of which certain combinations of lenses and prisms refract a beam of white light without producing dispersion of certain colors. (See DISPERSION.) Newton, misled by imperfect experiments, concluded that dispersion could not be annulled without annulling refraction. Hall, in 1733, and later, Dollond (independently), found that certain media have large powers of refraction with small dispersion, while others give small refraction with large dispersion; so that the dispersion of two colors produced by one medium can be corrected by that due to another, while the deviation of the light from its original direction is not entirely annulled. For example, by properly combining a convex lens of crown-glass with a concave one of flint-glass an "achromatic lens" can be produced which will have the same focus for the two selected colors, while the foci for the other colors are at neighboring points along the axis of the lens. It is thus seen that the achromatism in the above arrangement is not perfect.

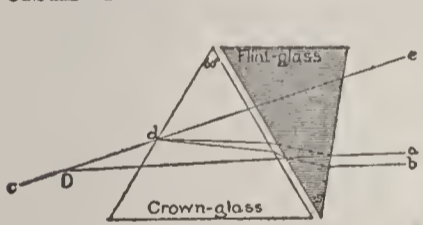


FIG. 1.
ACHROMATIC PRISM.

In Fig. 1 a beam of white light having the direction *cd* meets the crown-glass prism and is refracted. Dispersion also takes place, and the beam as it emerges is separated into its component

colors. Adjacent to the prism of crown-glass is one of flint-glass, whose action is to bring together the rays so that they emerge parallel, with the desired deviation. The reason is that prisms of different media do not give exactly similar spectra, the colors being dispersed according to different laws for different media. Fig. 2 shows achromatic combinations of lenses where the flint and crown glasses are combined with the same effect as in the achromatic prism illustrated. A combination of three lenses, or prisms, gives a better approximation to absolute achromatism than a combination of two.

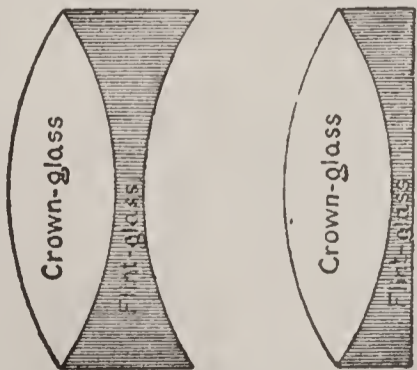


FIG. 2.
ACHROMATIC LENSES.

If a lens is to be used for visual observations, it is "corrected" generally for a definite wave-length in the yellow and one in the bluish green, i.e., these two colors

are brought to the same focus; but if it is to be used for photographic purposes, it is "corrected" for two wave-lengths, which include those radiations possessing the greatest photographic action. There are two defects which a lens may have, owing to chromatic aberration (q.v.), in that the colored images may be at different distances from the lens and that they may be of different sizes. The second of these defects is insignificant if the lens is thin; and the first may be "corrected," as just described, by combining two thin lenses. If the lens is thick, or if the lenses of the lens system are some distance apart, the second of the above-mentioned errors becomes serious. It may, however, be corrected.

A CHULA, ä-shōō'lä (Portug.). A dance similar to the fandango (q.v.).

ACHURCH', JANET (1864-1916). The stage name of Janet Achurch Sharp, an English actress, the wife of Mr. Charles Charrington. She was born in Lancashire, Jan. 17, 1864, and first appeared in London at the Olympic Theatre in January, 1883. In 1887 she joined Beerbohm Tree's company, and June 7, 1889, she took the management of the Novelty Theatre and created in English the part of Nora Helmer in *A Doll's House*. This was the first presentation of an Ibsen play to the English public. She has since toured with a company in India and Australia and appeared in the United States with Richard Mansfield (1895) and independently. In June, 1897, at the Olympic Theatre, London, she took the Shakespearean part of Cleopatra, and she appeared later in some of Bernard Shaw's plays. She appeared in the parts of Hermione in *Andromache* at the Garrick, February, 1901, and of Queen Katharine in *King Henry VIII*. In January, 1911, she played at court as Merete Beyer in *The Witch*.

ACHZIB, äk'zīb. 1. A Phœnician city claimed by Asher (Josh. xix. 29), but not conquered (Judg. i. 31); the modern Ez-Zib on the promontory of Ras-en-Nakurah, 9 miles north of Accho. Achzib is mentioned by Sennacherib. 2. A town in the Shephelah of Judah (Josh. xv. 44). Possibly the modern 'Ain-el-Kezbeh.

ACIDASPIS, äs'i-däs'pīs (Gk. *ἀκίς*, *akis*, spine + *ἀσπίς*, *aspis*, shield). A peculiar genus of trilobites found in rocks of Silurian and Devonian age in nearly all parts of the world. The individuals are, as a rule, small and are remarkable because of the spiny ornamentation of the dorsal shield or carapace. The lobation of the head shield is rather peculiar and quite unlike that seen in any other genus of trilobites, the trilobite division being obscured by a number of supplementary furrows and by the strong development of two longitudinal false furrows between the normal dorsal furrows. The thorax contains nine or ten segments, and the tail shield is of rather small size. In some species a row of slender spines is developed upon the sides of the head shield and a long spine projects from each posterior angle. Besides these there are often two long straight or curved spines directed upward and backward from the middle posterior edge of the head. Each segment of the thorax is produced laterally into long spines, and there are also two short spines on the raised median portion of each segment. The tail shield is in nearly all species likewise furnished with spines, so that on the whole these animals must, though of small size, have presented a rather formidable aspect to

larger animals which sought to prey upon them. A few species of the genus are of particular interest on account of the abnormal development of the eyes, which are placed at the summits of highly elevated, slender, though immovable, stalks, which arrangement enabled the animal to command a view in all directions. This elevation of the eye recalls the stalk-eyes of some modern crabs and lobsters. For illustration, see Plate of TRILOBITES.

ACIDIM'ETRY AND AL'KALIM'ETRY.

Terms applied in analytical chemistry to the determination of the amount of acid or of alkali, respectively, contained in a given solution, or to the volumetric determination of the relative strengths of acid and alkaline solutions.

ACIDS, *ās'idz* (Lat. *acidus*, sour). A large and important class of chemical substances. They all contain hydrogen, part or all of which is replaced when the acids are brought in contact with a metal as a base. (See **BASE**.) The compounds formed by substituting metals for the hydrogen of acids are termed the salts of those metals, and therefore the acids themselves may be regarded as salts of hydrogen.

Most acids have a sour taste and change the blue color of litmus to red. These properties, however, are not strictly characteristic of acids, silicic acid, for instance, possessing neither, though—like a true acid—it combines with metallic hydroxides to form salts.

According to the maximum number of their hydrogen atoms replaceable by metals acids are termed mono-basic, di-basic, tri-basic, etc. No matter how great the excess of potassium hydroxide employed, only one hydrogen atom of acetic acid, $C_2H_4O_2$, can be replaced by potassium, the only resulting salt having the formula $C_2H_3KO_2$. Acetic acid is, therefore, said to be a mono-basic acid. By the action of a limited amount of potassium hydroxide on sulphuric acid (H_2SO_4) a salt called the acid sulphate of potassium ($HKSO_4$) may be obtained; this salt is formed by substituting the metal potassium for one of the hydrogen atoms of sulphuric acid. But if an excess of potassium hydroxide is used, both of the hydrogen atoms of sulphuric acid are replaced by potassium, and the salt known as the neutral sulphate of potassium (K_2SO_4) is produced. Sulphuric acid is therefore said to be a di-basic acid.

Acids containing carbon among their constituent elements are called organic acids, because some of them were originally found in the organic world. Most organic acids are found to contain one or more carboxyl groups ($COOH$); it is the hydrogen of these groups that is replaceable by metals. These acids are called carboxylic acids, and their basicity is determined by the number of carboxyl groups they contain. The carboxylic acids are subdivided into carbocyclic and fatty acids, according as their molecules do or do not contain those rings of which the so-called aromatic benzene-nucleus is the most important. Thus benzoic acid, C_6H_5COOH , is a carbocyclic acid; acetic acid, CH_3COOH , is a fatty acid. An interesting group of substances belonging to the aromatic series and, like acids, combining with metallic hydroxides, are not included among the true aromatic acids because they do not contain the carboxyl group. These substances, called phenols (q.v.), are found to be weaker than the weakest carboxylic acid known, viz., carbonic acid.

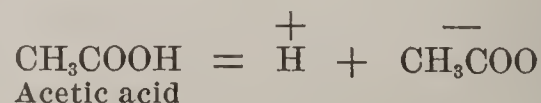
The specific strength of an acid depends, natu-

rally, on its composition and chemical constitution. But the precise nature of that relation is as yet unknown. The correctness of the very methods of measuring the strength of acids is, according to some eminent authors, still subject to doubt. It is, however, remarkable and cannot be denied, that the different methods employed yield very nearly coincident results.

One of those methods consists in determining the avidity of acids for a metallic hydroxide, as shown by the proportion in which the latter is distributed between two acids when brought in contact with a mixture of the two, the amount of metallic hydroxide employed being insufficient to saturate both acids completely. For example: sodium hydroxide, sulphuric acid, and nitric acid are weighed out in such quantities that the sodium hydroxide is just sufficient to neutralize either one of the two acids. When the three substances are now mixed together in aqueous solution, it is found that two-thirds of the sodium hydroxide have been taken up by the nitric acid and only one-third by the sulphuric acid. The conclusion is drawn that nitric acid is twice as strong an acid as sulphuric acid. It is similarly found that hydrochloric acid, too, is twice as strong as sulphuric acid, and hence possesses the same strength as nitric acid. Acetic acid is found to be very weak.

Another interesting method of determining the relative strength of acids consists in measuring the rapidity with which various acids are capable of effecting the inversion of sugar; that is to say, the decomposition of sugar into dextrose and levulose. For example, if equivalent quantities of nitric and hydrochloric acids are added to two equal portions of a solution of cane-sugar, it is found that, under the same conditions of temperature and concentration, the inversion takes place with equal rapidity in both cases; the conclusion is drawn that nitric and hydrochloric acids are equally strong acids. It is similarly found that these acids are about twice as strong as sulphuric acid, while acetic acid is found to be very weak.

When an acid is dissolved in water, its molecules are assumed to become dissociated into ions, some of which are charged with positive, some with negative, electricity. Thus acetic acid is supposed to break up according to the following equation:



The dissociation is usually incomplete; that is to say, only a fraction of the amount of acid in solution is dissociated into ions, the rest remaining undissociated. So that a solution of acetic acid, for instance, contains three kinds of particles, viz., (1) positive hydrogen ions, H ; (2) negative ions, CH_3COO ; and (3) electrically neutral (undissociated) acetic acid molecules, CH_3COOH . The magnitude of the fraction dissociated, or, as it is called, the degree of dissociation of an acid, depends (*a*) upon the amount of acid in solution; (*b*) upon the temperature; and (*c*) upon the nature of the acid. Under the same conditions of concentration and temperature the number of free ions in solutions of different acids depends upon nothing but the nature of the acids. And as according to the electrolytic theory the capacity of an acid for conducting electricity depends upon nothing but

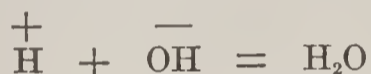
the presence of free ions in its solution, the electrical conductivity of the solution may be taken as a measure, so to speak, of the nature of the acid.

Now, when the acids are tabularly arranged in the order of their electrical conductivity, it is found that the order is the same as when they are arranged according to their avidity for metallic hydroxides, or when they are arranged in the order of the rapidity with which they can effect the inversion of cane-sugar.

A remarkable relation is thus seen, to exist between three phenomena having apparently no connection with one another. The common cause of these phenomena is assumed to be the presence of free hydrogen ions in an acid solution. Furthermore, on this assumption the neutralization of acids by metallic hydroxides is explained in the following manner. The fact that pure water is a non-conductor of electricity proves that its molecules are not dissociated into ions. If ions formed by the elements of water meet in a solution, they must immediately combine to form undissociated molecules of water. Now, while the solution of an acid contains electro-

positive hydrogen ions, $\overset{+}{\text{H}}$, the solution of a metallic hydroxide contains electro-negative hy-

droxyl ions, OH^- . When the solutions are mixed, these ions combine into neutral molecules of water, according to the following equation:



The disappearance of free hydroxyl and hydrogen ions as such causes the simultaneous disappearance of the properties both of the basic hydroxide and of the acid; and the acid and base are said to have neutralized each other.

ACINE'TA. A genus of protozoans, more particularly suctorial infusorians, with cilia only in the young state, lacking mouth and arms and absorbing food through tentacles. The body is fixed and stalked, and the tentacles are knobbed and retractile.

ACIREALE, ä'chè-râ-ä'lâ (Sicil. *Iaci*). A city in Catania, Sicily, 530 feet above the sea, at the mouth of the river Acis, which descends from Mount Etna to form a small harbor here, 9 miles northeast of the city of Catania (Map: Italy, K 10). The broad streets, spacious houses, and high towers rest on beds of lava, from which many of them were constructed after the earthquake of 1693. The climate is considered very healthful, and in summer the Terme di Santa Venere offers baths of tepid mineral water containing sulphur, salt, and iodine. There are pleasant walks and drives to neighboring villages on the slopes of Mount Etna, and the grotto of Galatea and the cave of Polyphemus are in the neighborhood. The coast south of Acireale is steep, and has risen more than 40 feet during the historical period. In the sea nearby rise the Scogli de' Ciclopi, the rocks which according to tradition were hurled after the wily Ulysses by the blinded Polyphemus. The most beautiful of them is about 230 feet high and 2300 feet in circumference, and consists of basalt containing wonderful crystals and covered with hard limestone with imbedded fossil shells. The city has a gymnasium and a technical school, and one of the old families possesses a splendid collection of Sicilian coins. The

manufactures are silk, linen, and cotton goods, knives and shears, and there is an important commerce in flax and grain. Pop., 1901, 35,203; 1911, 35,587.

A'CIS (Gk. "Ακίς, *Akis*). A small stream flowing from the foot of Mount Etna in Sicily, famous for its cold waters. Legend derived the name from Acis, son of Faunus and Symæthis, beloved by the nymph Galatea. The Cyclops Polyphemus, jealous of the boy, crushed him under a rock, and his blood, gushing forth, was changed into the river. See GALATEA.

ACK'ER, CHARLES ERNEST (1868—). An American inventor and manufacturer, born in Bourbon, Ind. After receiving a baccalaureate degree at Cornell University in 1888, he began the practice of electrical engineering in Chicago, where he remained until 1893. He originated the Acker process of manufacturing caustic soda by the electrolysis of molten salt and was the first in America to manufacture carbon tetrachloride. Works were built by him at Niagara Falls for the preparation of these and other products. He was granted many patents for inventions pertaining to chemical and electrochemical processes and was awarded the Cresson gold medal by the Franklin Institute. He became a member of many chemical and other scientific societies.

ACKERMANN, äk'ër-mân, JOHANN CHRISTIAN GOTTLIEB (1756–1801). A German physician, born at Zeulenroda in Saxony. He began the study of medicine in 1771 at the University of Jena under Baldinger, and was professor of medicine at the University of Altdorf from 1786 until his death. He is the author of *Institutiones Historiæ Medicinæ* (1792); *Institutiones Therapiæ Generalis* (1784–95); *Bemerkungen über die Kenntniss und Kur einiger Krankheiten* (1794–1800).

ACKERMANN, KONRAD ERNST (1712–71). One of the founders of German dramatic art. He began his career as an actor with the famous Schönmänn company at Lüneburg in January, 1740. Upon the outbreak of the disastrous Seven Years' War he sold a theatre he had erected in Königsberg, and the loss thus entailed compelled him thenceforth to lead a wandering life with his troupe. On July 31, 1765, he opened a new theatre at Hamburg, which, according to Lessing, eventually set the standard for theatrical performances in Germany. Besides the members of his own family, the companies organized by Ackermann included some of the ablest talent in Germany. The theatre was conducted by him until 1767, when it passed into the hands of twelve citizens of Hamburg, and was thereafter known as the *Deutsches Nationaltheater*. Ackermann's representations were models of freshness and vigor, and although he lacked qualifications requisite for heroic and emotional parts, his acting of many character rôles was remarkable.

ACKERMANN, LOUISE VICTORINE CHOQUET (1813–90). A modern writer of French poetry, who was born in Paris. In 1838, while studying German in Berlin, she met the linguist Paul Ackermann, whom she married (1843) and with whom she lived happily for some two years, when he died. Retiring to Nice, she published a number of charming and light-hearted poems under the title of *Contes en vers*. Seven years later, a morbid introspection at the thought of human suffering seemed to grow upon her, and she began to write poems that were remarkably

forceful in their thought, but gloomy and with a depth of despair which excited the attention of many readers. These were put forth under the titles *Poésies*, *Poésies premières*, and *Poésies philosophiques*. For a long time she wrote no more verses, but removed to Paris, where she became known for the distinguished people who frequented her salon. Her last book is *Pensées d'une solitaire* (Paris, 1874), containing a short autobiography. She died at Nice in 1890, having made a reputation that is likely to be lasting and that has been the theme of many criticisms. Consult the appreciation of Madame Ackermann written by the Comte d'Haussonville (1882), and Citoteux, *Mme. Ackermann d'après de nombreux documents inédits* (Paris, 1906). Anatole France has written of her in the fourth series of his *Vie littéraire* (1892).

ACKERMANN, RUDOLPH (1764-1834). A German-English inventor and publisher. He was born at Schneeberg, Saxony, and followed the occupation of coach builder and saddler in various German cities, as well as in Paris and London. He established an art school in London in 1795. In 1801 he patented a method of rendering paper, cloth, and other fabrics waterproof, and for this purpose erected a factory at Chelsea, England. He also contributed greatly to the development of lithography. It is, however, as a publisher of fine-art subjects that Ackermann is best known. His greatest achievement in this field was the *Repository of Arts, Literature, Fashions, Manufactures, etc.*, a publication which was continued regularly until 1828, when 40 volumes had appeared. Many of the plates were supplied by Rowlandson and other eminent artists. Among his other numerous illustrative works is *The World in Miniature* (43 vols., 1821-26).

ACKNOWLEDGMENT. 1. An admission by a person that he owes a debt or is subject to a liability which, but for such acknowledgment, would be barred by the statute of limitations. It need not be in any set form of words, but it must be a clear admission of an identified liability, and modern statutes often require it to be in writing. (See **LIMITATION OF ACTIONS**.) 2. The term is also applied to the formal act of declaring, before a notary public or other proper officer, that a written instrument executed by the declarant is his act and deed. It is applied also to the certificate of the officer setting forth the facts connected with such declaration. An acknowledgment is not essential to the validity of an instrument, unless made so by statute, although by recording acts (q.v.) it is generally required in order that the instrument may be lawfully recorded. In England and in many of our States a deed of conveyance or release of dower by a married woman is declared invalid by statute, unless, upon an examination apart from her husband, she acknowledges that she executed the deed of her own free will. Such a conveyance has taken the place of the conveyance by fictitious suit, known as a fine (q.v.). The object of this legislation has been declared by the United States Supreme Court to be twofold: not only to protect the wife by making it the duty of the officer taking the acknowledgment to certify that she has not acted under compulsion of her husband or in ignorance of the contents of the deed, but also to facilitate the conveyance of the estates of married women, and to secure and perpetuate evidence upon which innocent grantees as well as subsequent

purchasers may rely that the requirements of the statute necessary to give validity to the deed have been complied with. Such an examination and certificate is a quasi-judicial act, and can be impeached and invalidated only for fraud. Judges, clerks of courts, mayors, notaries public, commissioners of deeds, and justices of the peace are authorized in most States to take acknowledgments. The laws of the State in which the acknowledgment is to be used determine its sufficiency. For forms of acknowledgments consult Hubbell, *Legal Directory for Lawyers and Business Men* (New York, revised annually); Abbott's *Forms* (New York). See **DEED** and the authorities referred to.

ACLAND, CHRISTIAN HENRIETTA CAROLINE (1750-1815). Commonly known as Lady Harriet Acland, the wife of John Dyke Acland, an English officer in the American Revolution. She was married in 1770, and in 1776 accompanied her husband, then commander of grenadiers, to America, and with him endured most of the hardships of the Burgoyne campaign. Major Acland became dangerously ill in Canada, but was nursed back to health by her, and was again tenderly cared for by her after being wounded in the battle of Hubbardton (July 7, 1777). In the second battle of Saratoga (Oct. 7, 1777) he was severely wounded and became a prisoner in the hands of the Americans. Lady Acland, hearing of this, bravely entered the American camp, where she was received with the utmost courtesy. She rejoined her husband at Albany, and nursed him until his wounds had healed, when she returned with him to England. Major Acland died in 1778, as the result of a cold contracted while fighting a duel, and Lady Harriet, contrary to the usual accounts, did not marry again. Consult Stone, "Sketch of Lady Harriet Acland," in *Ballads and Poems Relating to the Burgoyne Campaign* (Albany, 1893).

ACLAND, Sir HENRY WENTWORTH DYKE (1815-1900). An English physician. He was born at Exeter and was educated at Oxford. He was one of the founders of the Oxford University Museum, and in 1859 published, with Ruskin, an account of the aims of that institution. He accompanied the Prince of Wales to America in 1860. He was knighted in 1890. In 1894 he tendered his resignation as regius professor of medicine at Oxford, which position he had occupied since 1858. His more important publications include the *Memoir on the Visitation of the Cholera in Oxford in 1854*, and *Village Health* (1884).

ACLAND, JOHN DYKE. See **ACLAND, CHRISTIAN HENRIETTA CAROLINE**.

ACLIN'IC LINE (not inclining, from Gk. *ἀκλίνας*, *aklinein*, to incline). This is an imaginary line around the earth between the tropics where the magnetic needle has no inclination; that is, where, when balanced free to turn in any direction, it places itself horizontal. It is called the magnetic equator, and is about 90° from the magnetic poles. The line is variable and irregular. In 1913, in the Western Hemisphere, it was south, and, in the eastern, north, of the geographical equator. Consult charts giving isoclinical lines for the world, published from time to time by the British Admiralty and for the United States by the Coast and Geodetic Survey. See **MAGNETISM, TERRESTRIAL**.

ACMITE (Gk. *ἀκμή*, *akmē*, point, edge). A sodium-iron silicate of the pyroxene (q.v.) group

that crystallizes in the monoclinic system, has a vitreous to resinous lustre, and is red to brown and green in color. It occurs in the older rocks in Sweden and Greenland, and in the United States minute crystals have been found in northwestern New Jersey, while fine prismatic crystals, frequently 8 inches in length, occur at Hot Springs and Magnet Cove, Ark. It is called acmite from the sharp-pointed extremities of its crystals.



ACCLITIC LINE.

ACNE: ACNE VULGARIS. Pimples (probably from Gk. ἀκμή, *akmē*, a point). An inflammatory disorder of the sebaceous glands of the skin (q.v.), characterized by the formation of papules, pustules, or tubercles, and running a chronic course. An acne lesion is a folliculitis due to the retention and decomposition of the sebaceous secretion, set up primarily by the acne bacillus, and later invaded by the pus-producing organism, *Staphylococcus pyogenes*. Predisposing causes of acne are puberty, a period of great and often perverted glandular activity; chronic indigestion and constipation, anæmia, uterine disorders, and general debility from whatever cause. Certain drugs, notably the iodides and bromides, produce the eruption. Pimples are most frequently found on the face, particularly about the nose, chin, and forehead, but also occur on the chest, shoulders, and back. Comedones, or blackheads, are usually associated with, and may produce, acne pustules. They arise from the sealing of the mouths of the follicles by dust or sebaceous matter, and when squeezed out appear as a spiral, white mass with a black point, resembling a worm, for which they have been mistaken. In the expressed matter a parasite, *Acarus folliculorum* (q.v.), may be found. *Acne indurata* is a pustular form of the disease, resulting in the production of large, irregular, deep-seated lesions, tender to the touch and exceedingly resistant to remedial measures. Treatment must include the correction of the underlying causes above enumerated, and the administration of tonics, of which arsenic, iron, sulphur, and calcium sulphide are most beneficial. A diet free from highly seasoned foods, alcoholic beverages, tea and coffee, is a necessary adjunct to the cure, together with hygienic measures such as outdoor exercise and

cold baths. Locally, hot bathing with soap and water, followed by a cold douche, cleanses and tones up the skin. Mild antiseptic lotions containing sulphur, mercury, salicylic acid or ichthyol are useful in freeing the skin from germs and reducing inflammation. Of late years light therapy (see PHOTOTHERAPY) has been employed with success, especially the Roentgen ray; and vaccines, prepared from the acne bacillus and various strains of staphylococcus (see SERUM THERAPY; VACCINE THERAPY), have given brilliant results in many cases.

Acne rosacea is a chronic hyperæmic disease of the face, more especially of the nose, characterized by hypertrophy, redness, dilatation of the blood vessels, and acne. In one form acne papules and pustules are abundant, and appear on a background of bright red, infiltrated skin. In another form of acne rosacea there is in addition a hypertrophy of the nose or chin. If the hypertrophy becomes excessive, the term acne hypertrophica or rhinophyma is applied. The causes of rosacea are in the main similar to those of acne vulgaris, but the disease appears late in life, and is often due to the excessive use of alcohol in men, and tea in women.

ACOCK'BILL. See ANCHOR.

ACEMETÆ, äs'è-mè'tè (Gk. ἀ, *a*, priv. + κοιμάσθαι, *koimasthai*, to sleep). A class of Greek monks called watchers, who chanted service continuously day and night, dividing, like sailors, into three watches. They originated about 400 A.D. on the Euphrates, later appeared in Constantinople, and established many monasteries, the chief one being the Studium in Constantinople itself, erected by the consul Studius in 471. They were excommunicated in 534 by Pope John II for opposing the formula, "One of the Trinity suffered," and thus placing themselves on the Nestorian side.

ACOIN, ä-kō'in. A white crystalline substance, soluble in water, derived from guanin, and closely related to caffeine and theobromine. Chemically, it is di-para-anisyl-mono-phen-ethyl-guanidin-chlor-hydrate. Experiments have shown that it is less toxic than cocaine (q.v.), and it was formerly employed as a substitute for that drug to produce local anæsthesia in the eye.

ACOLLAS, ä'kō'lä', EMILE (1826-91). A French jurist and publicist. He was born at La Châtre and was educated at Bourges and Paris. He was one of the most conspicuous representatives at the Congress at Geneva in 1867, when the formation of a general European democratic confederation was advocated and upon his return to France was condemned to one year's imprisonment for his active participation in the deliberations of that party. In 1871 the Paris Commune nominated him, during his absence in Switzerland, president of the legal faculty, and in 1880 he was appointed inspector-general of the penitentiaries. Among his numerous publications, all of which emphasize the principles "Droit et Liberté," the most important is *Cours élémentaire de droit*, a work consisting of seven volumes, published in the form of manuals.

ACOLYTES, äk'ō-lits (Gk. ἀκόλουθος, *akolouthos*, a follower). A name occurring first about the third century, and applied to functionaries who assisted the bishops and priests in the performance of religious rites, lighting the candles, presenting the wine and water at the communion, etc. They were considered as in holy orders and ranked next to sub-deacons.

These services have since the seventh century been performed by laymen and boys, who are improperly called acolytes; but in the Roman church aspirants to the priesthood are still at one stage consecrated as acolytes and receive candles and cups as the symbols of the office. See **ORDERS, HOLY**.

ACOMA, á'kō-mà. An Indian pueblo in Valencia Co., New Mexico, about 70 miles west of Albuquerque (Map: New Mexico, E 2). Pop., 1900, 492; 1902, 650; 1910, 828. With Isleta it has the distinction of occupying its sixteenth-century site, and is the oldest continuously occupied town in the United States. It was visited (1540) by members of Coronado's expedition, by Espejo (1583) and Juan de Oñate (1598). Espejo named it Acoma; previously it was known as Acus, Acuco, and Coco. In December, 1598, Juan de Zaldivar, of Oñate's force, visited Acoma and, with half his party of 30, was killed by the natives. In the next month his brother Vicente killed half the Acoma population of 3000 and partly burned the pueblo. Franciscans labored here before 1629 and later established the San Estevan Mission. The Acomas successively occupied many village sites in prehistoric times, the last before Acoma being Katzimo, the enchanted mesa, 3 miles distant. Water in the Acoma mesa is obtained from natural cavities in the rocky summit (357 feet high). The Acoma reservation comprises 95,792 acres. Consult: H. H. Bancroft, *History of Arizona and New Mexico* (San Francisco, 1889); Lummis, *Land of Poco Tiempo* (New York, 1893); and Hodge, "The Enchanted Mesa," in *National Geographic Magazine*, vol. viii (Washington, 1897).

ACONCAGUA, ä'kōn-kä'gwä; Span.-Amer. pron. kä'wä. An extinct volcano in the southern part of the Andes, situated in lat. 32° 39' S., long. 70° W., on the boundary line between Chile and Argentina, and belonging to the latter (Map: Chile, C 10). It is usually considered the loftiest mountain in America, its estimated height being about 23,000 feet. A river of the same name rises on the south slope of the mountain and enters the Pacific after a course of over 200 miles. Consult: E. Fitzgerald, "The First Ascent of Aconcagua," in *McClure's Magazine*, vol. xi (New York, 1898); Sir M. Conway, "Aconcagua and the Volcanic Andes," *Harper's Magazine*, vol. c (New York, 1899).

ACONCAGUA. A central province of Chile, lying to the west of Mt. Aconcagua (q.v.) about in lat. 32° S. Its most fertile part is the valley of the Aconcagua River, after which it is named (Map: Chile, C 10). It covers an area of 5487 square miles. The mountainous regions which occupy the larger part are mostly barren, while the valleys have rich soil and produce different kinds of fruit, hemp, grain, and wine. The province contains considerable deposits of copper, silver, iron, lead, etc., and mining is the principal industry. Pop., 1895, 113,165; 1903, 132,670; 1910, 132,730. Capital, San Felipe (q.v.).

ACONITE, ACONITUM (Lat. *aconitum*, Gk. ἀκόνιτον, *akoniton*, wolf's-bane). A genus of about 70 species belonging to the family Ranunculaceæ, and mostly found in mountainous regions of northern latitudes. The large, showy flowers (usually blue), with their large and hooded or helmet-shaped sepal, have made them common ornamental plants. The characteristic hood of the flower is responsible for the common name "Monk's-hood." The roots, and sometimes

the flowers, are very poisonous, containing a number of alkaloids. The best known and most poisonous species is *Aconitum napellus*, which yields the officinal aconite. A number of species are cultivated for ornament, some of them having white or yellow flowers. There are comparatively few native species of aconite in the United States, three belonging to the eastern United States and several others in the Rocky Mountains and on the Pacific coast.

ACONITINE, a-kōn'ī-tīn or -tēn. See **ALKALOIDS**.

ACONTIUS, ä-kōn'shī-ūs (Gk. Ἀκόντιος, *Akontios*). The hero of a classic love story contained in a lost poem of Callimachus (q.v.) and also given by Ovid (*Heroides* xx, 21). He is a youth from Ceos, who, being at Delos and in love with Cydippe (q.v.), throws at her feet an apple on which he has written, "I swear by the sanctuary of Artemis to marry Acontius." Inadvertently she reads the words aloud, and in spite of her inclination to have nothing to do with the youth, is held by the goddess to her vow thus made. Consult Morris, "The Story of Acontius and Cydippe," in *The Earthly Paradise*, part iii (London, 1872).

ACORN, ä'kōrn or ä'kērn (properly, fruit of the field, AS. *æcer*, a field). The nut-like fruit of different species of oak. It consists of the nut proper and the cupule, or saucer or cup. The acorns from different species differ much in size, form, color, and taste. A few kinds of acorns are sweet and not unlike chestnuts in flavor, but most are bitter and more or less astringent in taste, owing to the presence of quercin, or some similar bitter principle, and tannin. On an average, the flesh of fresh acorns has the following percentage composition: water, 34.7; protein, 4.4; fat, 4.7; nitrogen, free extract, 50.4; crude fibre, 4.2; and ash, 1.6. The shell makes up 18 per cent of the total fruit, the flesh 82 per cent. Acorns are a favorite food of wild hogs and have been used since earliest times as feeding stuff for domestic animals, especially pigs. It is customary to let the pigs gather this food. Acorns and beechnuts are commonly spoken of as mast. The agreeable flavor of the pork, ham, and bacon of the razor-back hog of the southern United States is attributed in no small degree to its being fed on acorns. On the other hand, an excess of acorns may produce a soft, spongy flesh and an oily lard. This, however, is usually obviated by feeding corn for two or three weeks before slaughtering. Acorns have been successfully fed to milch cows and to poultry, but numerous cases of acorn poisoning in cattle are on record. In the United States acorns are not much eaten by men. Under the name "Biotes," the fruit of *Quercus emoryii* is used as food in the southwest. Sweet acorns are eaten occasionally in different regions, mainly by children. The Indians of the Pacific coast region from northern California to Mexico use acorns in considerable quantities. Dried and pounded, they are made into a sort of mush and also into bread. The acorn meal is usually leached to free it from tannin and whatever bitter principle is present. When the meal is used for bread, a kind of clay is sometimes mixed with it. In several regions of Italy, notably Umbria, Tuscany, Emilia, and the Marches, acorn meal made into a sort of bread with the addition of two-thirds ground grain is a common article of diet. The bread is black and heavy and not readily digestible.

Dried acorns ground are sometimes used as a substitute for coffee. See OAK.

ACORN-SHELL. A sessile barnacle of the family Balanidæ. See BARNACLE.

ACORUS (Gk. *ἄκωρος*, *akoros*, sweet-flag). A genus of two species belonging to the family Araceæ. (See ARUM.) One of the species, *Acorus calamus*, is widely distributed in the north temperate regions, while the other species is restricted to China and Japan. The range of the species is in swamps or along streams from Nova Scotia to Minnesota and southward to Louisiana and Texas. The very long horizontal rootstock sends up sword-shaped leaves and also a leaf-like stem which bears on one side a cylindrical cluster of small greenish-yellow flowers. It is the long aromatic rootstock (an underground stem) that is used and is called "calamus root." It is a powerful medicine of transient tonic effect, occasionally used, especially in cases of weak digestion. In many places on the Continent of Europe it is found in confectionery shops sliced and prepared with sugar. It is also used to correct the empyreumatic odor of spirits and to give them a peculiar flavor. In Great Britain it is chiefly employed by perfumers in the manufacture of hair powder.

ACOSTA, à-kōs'tà, GABRIEL, later URIEL (1594?-1647). A Portuguese philosopher, descended from a Jewish family. He was born at Oporto. After being educated in the doctrines of the Roman Catholic church, when 25 years of age he became skeptical, and then adopted the Jewish faith; but as the profession of such was not allowed him in his own country, he fled to Amsterdam, where he was formally received into the Jewish community, and changed his name, which had been Gabriel, to Uriel. But what he conceived to be the Pharisaism and spiritual pride of the Amsterdam Jews disgusted him, and he opposed many of their ideas and especially denied that the doctrine of immortality had any Mosaic sanction. Hence he became involved in a controversy with his rabbinical teachers. On account of his work, entitled *Examen dos tradiçoens Phariseas conferidas con a ley escrita* ('Examination of Pharisaic Traditions Compared with the Scripture'), 1624, he was charged with atheism by the Jews before the city magistracy and fined. He was also excommunicated and so remained for seven years, when he recanted after ignominious treatment. He died in 1647 by suicide. His autobiography was first published by P. Limborch in Latin, 1687; English translation, London, 1740; Latin and German edition, H. Jellinek, Leipzig, 1847. He is the hero of an effective tragedy, *Uriel Acosta*, by Gutzkow, and of a sketch by Zangwill in *Dreamers of the Ghetto* (Philadelphia, 1898). Consult: Klaas, *Uriel Acosta. Leben und Bekennntnis eines Freidenkers vor 300 Jahren* (Berlin, 1909).

ACOSTA, JOAQUIN (1799-1852). A South American geographer. He was born at Guaduas, Colombia. In 1834 he made a tour with the botanist Céspedes through the valley of the Socorro as far as the Magdalena, and seven years afterward traveled from Antioquia to Anserma for the purpose of studying the history and customs of the native tribes. Besides an excellent map of New Granada, Acosta published the following interesting and valuable works: *Compendio histórico del descubrimiento y colonización de la Nueva Granada en el siglo décimo sexto* (1848);

Semenario de la Nueva Granada, Miscellánea de ciencias, literatura, artes e industria, with portraits and map, published in conjunction with Laserre under the direction of Francisco José de Caldas (1849).

ACOSTA, JOSÉ DE (1539-1600). A Spanish Jesuit. He was born at Medina del Campo, Spain. He entered the Society of Jesus and went as missionary to Peru, where he labored for many years. Upon his return home he became superior of the Jesuit Seminary of Valladolid, and afterward rector of the University of Salamanca, where he died. His fame rests upon his work on the natural history of the New World and the efforts put forth for its evangelization, published in Latin at Salamanca in 1589 and in Spanish (Seville, 1590). The last-named publication was under the caption *Historia natural y moral de las Indias*, and was several times reprinted and translated into French, Dutch, and English (*The Naturale and Morale Historie of the East and West Indies*, London, 1604).

ACOUCHEY, à-kōō'shê, or **ACUCHI**. See AGOUTI.

ACOUMETER, à-kōō'mê-têr or à-kou'-, or **AC'OUSIM'ETER** (Gk. *ἀκούειν*, *akouein*, to hear + *μέτρον*, *metron*, measure). An instrument used to determine the acuteness of hearing. It is a small steel bar which, when struck by a hammer, gives a uniform sound.

ACOUSTICS, à-kou'stiks or à-kōō'- (Gk. *ἀκουστικός*, *akoustikos*, relating to hearing, from *ἀκούειν*, *akouein*, to hear). The name applied to the science of the phenomena of sound. The name "sound" is given to the sensation perceived by the auditory nerves, and it is a matter of everyday experience that the immediate cause of the sensation is some vibrating body, e.g., a violin string, a drum-head, a hammer when striking a nail. This was early recognized, and, so far as acoustics is considered as a science dealing with the vibrations of matter and with the waves produced in the air by this motion, the history of its development is identical with the progress of mathematics and dynamics from the time of Galileo and Newton to the present. Few dates can be assigned to definite discoveries. The laws of vibrations of a stretched string were first deduced mathematically by Brook Taylor in 1715 and by Daniel Bernoulli in 1755, although they had been discovered experimentally by Mersenne in 1636. Longitudinal and torsional vibrations of bars were first investigated by Chladni (1756-1827). Daniel Bernoulli was the first to attack the problem of the lateral vibrations of bars; but the mathematical treatment of the question is still of interest. Poisson (1829) was the first to give a correct mathematical solution of the free vibrations of a membrane, and good experimental work on the subject has been done by Savart, Bourget, and Elsas. The vibrations of plates have been studied mathematically by Poisson, Kirchhoff, and more recent writers, and experimentally by Chladni, Savart, and Wheatstone. A full account of the history of the mathematical side of acoustics will be found in Rayleigh's great work on the *Theory of Sound*.

The history of that portion of acoustics which considers the phenomena of the sense of hearing, harmony, discord, pitch, etc., begins undoubtedly with the earliest days of civilization. It was known to Pythagoras (sixth century B.C.)—and to whom before him no one can tell—that sounds were in harmony when produced by two

stretched strings of the same material, cross-section and tension, provided their lengths were in the ratio of 1 : 2, 2 : 3, or 3 : 4. Mersenne discovered in 1636 that the frequencies of such vibrating strings varied inversely as their lengths, and so proved that for two notes to be in harmony it was necessary for their frequencies to bear simple numerical relations to each other. No explanation of this fact was given until the great research of Helmholtz, begun in 1854, the results of which were published in 1862 in his classical work on the *Sensations of Tone*. Helmholtz was the first to discover the existence of summational tones, although the differential tones were discovered probably by Romieu in 1743, and certainly by Sorge, the court organist at Lobenstein, in 1745. Helmholtz's theory of vowel sounds is still under discussion. Most interesting work on audition has been done in recent years by Rudolf König of Paris and Professor Bevier of Rutgers College.

Many of the physical properties of sound are matters of common experience and can readily be appreciated. In the first place, it is well known that an interval of time elapses between the vibration of the body and the perception of the resulting sound if the vibrating body is at a considerable distance; thus the flash of a gun is seen before the sound is heard. It was shown by Otto von Guericke that if a bell is set ringing in a glass jar from which the air has been exhausted no sound is heard; so that the presence of some material medium between the vibrating body and the ear is essential for the production of sound. This medium need not be air, but may be water, or, in fact, any gas, liquid, or solid which can carry waves. The whole mechanism is, then, as follows: The vibrations of the body, e.g., a drum-head, produce waves in the medium in contact with it, e.g., the air; these waves spread out through the medium and, after a certain interval of time, reach the ear; in the ear the waves produce motions of the ear-drum and corresponding effects in the internal ear where the auditory nerves have their endings. It should be noted that not every vibration will produce waves in a fluid medium; because if the number of vibrations per second is too small, the fluid will simply flow around the body as it vibrates, and so will not be compressed; consequently, in order to produce waves in a fluid, the frequency of the vibrations of the body must exceed a certain number, which depends upon the viscosity and density of the fluid. Further, it is evident that, since fluids can carry only compressional (i.e., longitudinal) waves, the production of the sound-sensation is due to waves of this kind. The difference between the longitudinal and the transverse wave can be appreci-

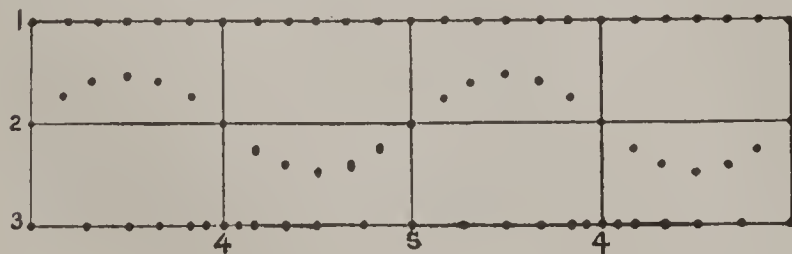


FIG. 1.

ated by reference to the accompanying diagram, Fig. 1. In this illustration 1 represents a row of particles at rest; these particles displaced to form a simple transverse wave are shown in 2, while a longitudinal wave is shown in 3.

Here each particle moves to and fro in the direction of the line of propagation of the wave, and the amplitude of the wave is the distance that each particle moves from its position of rest, while the wave-length is the distance between similar points of condensation and rarefaction, as from 4 to 4. Although sound is produced by longitudinal waves, there is no reason for believing that all compressional waves will produce sounds; some may be too long or too short to affect the nerves of the ear.

Our sense of hearing distinguishes between two great classes of sounds: noises and musical notes. A noise is recognized as being abrupt, discontinuous, and exceedingly complex; a musical note is smooth, continuous, and with a definite, regular character. We distinguish, further, between different musical notes as being simple or complex, meaning, by the latter, a note in which we can recognize the presence of several simple tones. Thus, if a piece of paper is torn, or two blocks of wood struck together, we call the resulting sound a noise. The vibrations of a tuning-fork cause a simple musical note; while if a banjo string is plucked we hear a complex note. Complex notes differ greatly in their character. They are said to have "quality" or "timbre"; thus, a sound produced by an organ-pipe has a quality entirely different from one produced by a piano or by a drum. Simple notes may differ in loudness and in shrillness or "pitch"; thus, a note of a definite pitch may be loud or feeble, and the pitch of a piccolo note is quite different from that of a note produced by a flute.

Waves and Vibrations. Since the direct cause of a sound is the reception into the ear of waves in the air, it is necessary to analyze the nature of these waves. We may have an irregular, isolated disturbance, which is analogous to a "hump" passing along a stretched rope, or to the effect of dropping several stones at random intervals into a pool of water; or we may have a regular continuous succession of waves identical in all respects, which is called a "train of waves." The simplest kind of train of waves is what is called a "simple harmonic" train, such as is produced in any medium by a simple harmonic vibration of the body which is causing the waves. (Vibrations of a pendulum are simple harmonic.) Such a train of waves is characterized by its "wave-number" and "amplitude"; the wave-number being the number of individual waves which pass a given fixed point in one second, while the amplitude is the extent of the path of vibration of any particle of the medium through which the waves are passing. The velocity of waves of a definite character, e.g., compressional ones, in any definite homogeneous medium depends upon the properties of the medium itself, not on the wave-number or amplitude of the waves. So, if λ is the wave-length, i.e., the distance from one point in the medium to the next point, measured in the direction of advance of the waves, where the conditions are identical with those at the first point, and if N is the wave-number, the velocity of the waves V is given by the formula

$$V = N \lambda$$

Consequently, if N is known, λ can be calculated, and vice versa; and the characteristics of the simple harmonic train of waves may be said to be its wave-length and its amplitude. If several

trains of waves are passing through the same medium at the same time, the resulting waves—called a “complex” train—is simply the sum of the individual waves, the motion of any particle of the medium being the geometrical sum of the motions which it would have, owing to each of the separate trains of waves. (This is rigidly true only if the amplitudes of these separate trains are very small compared with their wavelengths, as in general they are.) This is shown

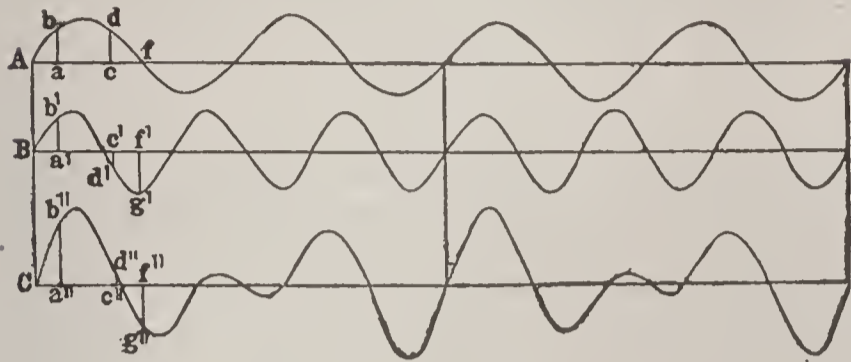


FIG. 2.

in Fig. 2, where *A* and *B* are two sets of simple harmonic waves which form the resultant wave *C*. This wave is obtained by taking the algebraic sum of the motion of the particles. The point *b''* is obtained by taking *a''b''*, equal to the sum of *a b* and *a'b'*, *c'' d''* is the sum of *c d* and *c'd'*, the latter, as it occurs below the axis, considered as having a negative sign. Conversely, it may be shown that any complex train of waves may be analyzed into simple harmonic trains. Therefore complex trains of waves may differ in several ways: 1. The number of the component simple harmonic trains. 2. Their wave-numbers and amplitudes. 3. Their relative “phases,” for two waves are in different phase if the maximum displacement due to one train does not coincide in position with that due to the other; or, looked at in another way, the component trains may have been started at irregular intervals. Since waves are due to the vibrations of some elastic body (e.g., a tuning-fork, the air in an organ-pipe or horn), it is necessary next to analyze the nature of vibrations. We may have an irregular vibration, consisting of only a few to and fro motions, then a sudden change into another vibration of a different character, the whole motion lasting only a short time, e.g., when a piece of stiff paper is torn or when a scratching pen is used in writing; or we may have a regular continuous periodic vibration. The simplest possible periodic vibration is like that of a simple pendulum, and it is called “simple harmonic.” It is characterized by a definite number of vibrations per second, i.e., its “frequency,” and by the extent of the swing, i.e., its “amplitude.” If a second pendulum is suspended from the bob of the first, and a third from the bob of the second, the vibration of the third and lowest bob is no longer simple harmonic in general. Its vibration is called “complex,” and it is evident that it is the sum of the vibrations of the separate pendulums. Complex vibrations may, therefore, differ in the number of the component vibrations and in their frequencies, amplitudes, and relative phases.

Sound Sensation. It would be expected that there should be some connection between the nature of the vibrations of the vibrating body, that of the waves produced, and that of the sound heard. Such is the case. A noise is al-

ways produced by an irregular, disconnected disturbance in the air; and this in turn is due to an irregular succession of vibrations, each lasting for a brief interval. A simple musical note is always due to a simple harmonic train of waves, and this to a simple harmonic vibration. The loudness of the note varies directly with the amplitude of the waves; whatever increases the amplitude of the waves increases the loudness of the sound, and vice versa. It is increased, therefore, by an increased amplitude of the vibration; and it decreases as the distance from the ear to the vibrating body is increased. (It should not be thought, however, that numerical values can be given the loudness of a sound, or that there is any fixed numerical relation between the amplitude of the waves and the intensity of the sensation.) The pitch of the note depends upon the wave-number of the waves entering the ear; whatever increases the wave-number “raises” the pitch, and vice versa. Therefore, if the ear and the vibrating body are at a fixed distance apart, and at rest with reference to their positions in space, the pitch will vary directly with the frequency of the vibrating body; thus we often use the expression, “a pitch of 300,” meaning the pitch of a sound produced by a vibrating body which makes 300 complete vibrations in one second. If, however, the vibrating body is approaching the ear, or if the ear is approaching the vibrating body, the number of waves entering the ear is greater than it would be if there were no such motion; and so the wave-number is greater than the frequency of the vibrating body, and the pitch of the sound is raised. Similarly, if the distance between the ear and the vibrating body is increasing, the wave-number is less than the frequency of the vibration, and the pitch is lowered. This change of pitch, due to the relative motions of the ear and the vibrating body in the surrounding medium, is known as Doppler’s Principle (q.v.), and is illustrated by the sudden drop in pitch if one stands on the platform of a railway station and listens to the whistle of a locomotive passing at a high speed.

A complex musical note is always due to a complex train of waves, and this, in turn, to a complex vibration, if there is only one vibrating body. Further, two notes which differ in quality may be shown to be due to complex trains of waves which differ in complexity. But it should be noted that all experimental evidence points to the idea that differences in relative phases of the component trains of waves do not cause differences in the quality of the sound heard. In other words, two complex trains of waves made up of the same simple waves will produce the same sound, regardless of the phases in the two trains. This may be explained by saying that the ear automatically resolves a complex train of waves into its simple harmonic component trains, hears the simple tones due to each of these, and therefore has a complex sensation. This statement is called “Ohm’s law for sound-sensation.”

Fundamental, Partial, and Combinational Vibrations. Musical instruments may be divided roughly into two classes, wind and string instruments. In the former class are included organ-pipes, horns, flutes, etc.; in the latter, pianos, violins, harps, etc. In all wind instruments a column of air inclosed in a metal or wooden tube is set in vibration by suitable means, and this vibrating mass produces the waves in the surrounding air. In string instru-

ments flexible strings are stretched between pegs fastened to a solid frame—in general a wooden board—and they are set in transverse vibration by bowing, plucking, or striking. As a result of the vibration of the string, the frame holding the pegs is itself set in vibrations of the same frequency, and it, as well as the string itself, produces the waves. The importance of the so-called sounding-board is at once evident. A

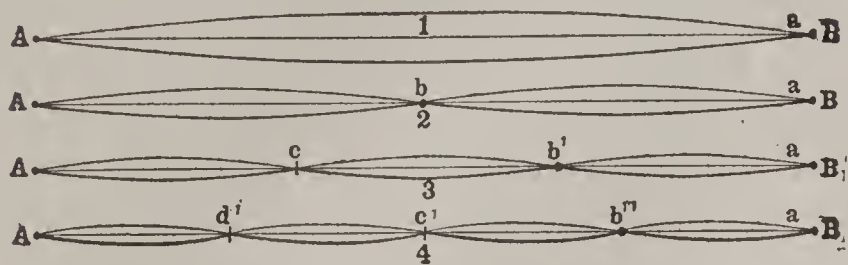


FIG. 3.

stretched flexible string, $A B$, can vibrate in many waves: as a whole, with its middle point its point of greatest amplitude, as in 1 (Fig. 3); in two parts, with its middle point, b , at rest, and the two halves vibrating like separate strings in opposite phases, as in 2 (Fig. 3); in three parts, with two points, c and b , at rest, dividing the string into three equal vibrating segments, as in 3 (Fig. 3), etc. The frequencies of these different modes of vibration are in the ratios of $1 : 2 : 3 : 4$, etc. The vibration of the string as a whole is called the "fundamental"; the others, the "upper partials." The frequency of the transverse vibrations of a stretched flexible string is given by the formula

$$N = \frac{1}{2L} \sqrt{\frac{T}{m}}$$

where T is the stretching force or tension, m is the mass of each unit length of the string, L is the length of the vibrating segment. Thus, in the fundamental, L is the length of the string; in the first upper partial it is one-half the length of the string, etc. When the string is set vibrating by a random blow or bowing, it will make complex vibrations, resulting from the combination of the fundamental and some of the upper partials, the number and relative intensities of these depending largely on the point where the blow is struck, or the bow applied, and on the character of the impulse. So, whenever a musical tone is produced by a string instrument, the ear can recognize in the complex sound simple tones due to the fundamental and the upper partials; and differences in the quality of sounds caused by different string instruments, which have fundamentals of the same

fundamental and upper partials whose frequencies are in the ratios of $1 : 2 : 3 : 4$, etc. The frequency of the vibrations of the fundamental in an open organ-pipe is given by the formula:

$$N = \frac{V}{2L}$$

where V is the velocity of waves in the gas which fills the pipe, and L is the length of the pipe approximately. The similar formula for a "stopped" pipe is:

$$N = \frac{V}{4L}$$

(In stopped organ-pipes the vibrations are in the ratios $1 : 3 : 5 : 7$, etc.) In other instruments than wind and string ones, such as drums, cymbals, etc., there are upper partials besides the fundamental; but there is no simple mathematical relation between their frequencies. When two organ-pipes on the same wind-chest are "sounded" loudly, the resulting waves in the air are not due simply to each fundamental and its upper partials, but also to certain extra vibrations due to the combined action of the two vibrating columns of air on the surrounding air. Thus, if the fundamentals of the two pipes have frequencies 1000 and 600, there will be present waves showing the existence of vibrations whose frequencies are $1000 + 600$ and $1000 - 600$. The sounds heard owing to these vibrations are called "summational" and "differential" tones, or, in general, "combinational" tones; they are often difficult to hear. The existence of both partial and combinational vibrations may, however, be established by means of resonators (q.v.).

Harmony and Discord. If two organ-pipes whose frequencies do not differ much are sounded together, the ear observes a fluctuation in the loudness of the resulting sound. It is first loud, then weak, loud and weak, etc., giving rise to what are called "beats," the number of beats per second being equal to the difference in the frequencies of the pipes. Thus, two pipes of frequencies 280 and 285 produce 5 beats per second. The explanation of the phenomenon lies in the superposition of the two resulting trains of waves; for, if the wave-number of one train exceeds that of the other by five, it will happen five times in the course of a second that when one train of waves reaches the ear in a certain phase, the other train will reach the ear in an exactly opposite phase; and so the two waves will tend to neutralize each other's action and thus make the sound weak; whereas, in between these instants of weakness there will be

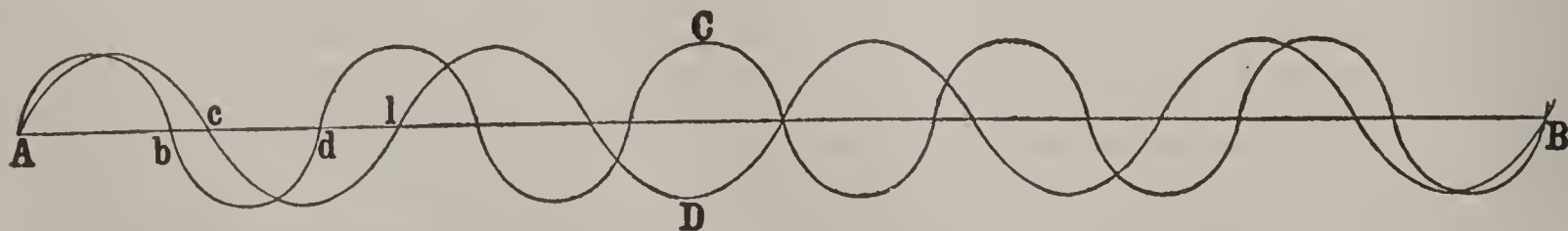


FIG. 4.

frequency, are due to differences in the number and character of the upper partials, which depend in turn on the material of the string, the point where the impulse is applied to set the string in motion, and the character of this impulse. Similarly, the vibrating column of air in organ-pipes, horns, etc., can vibrate in different ways; and in a complex vibration there is a

others when the two waves reach the ear in the same phase, and so reinforce each other and thus make the sound loud. This is shown diagrammatically in Fig. 4, where there are two trains of waves of unequal wave-number which interfere and produce beats. The wave-length of one set is $A d$, which is four-fifths of $A l$, the wave-length of the other. The two waves at A are in

the same phase, and there is increased sound; but as the motion progresses, one train loses with respect to the other, until they are in opposite phase, as at *C* and *D*, where silence ensues. Beats are disagreeable to hear, for the same reason that a flashing light is unpleasant to see, or a tickling feather to feel, namely, the nerves being first stimulated, then allowed to recover partially, then again stimulated, etc., are disagreeably affected. The degree of unpleasantness depends in part on the number of beats, but also on the pitch of the note, whose intensity is fluctuating. Beats can be formed by the interference of the upper partials as well as by the fundamentals, and by the combinational vibrations also. Thus, if two organ-pipes of frequencies 500 and 252 are sounded together, the first upper partial of the pipe whose fundamental is 252, i.e., a note of frequency 504, will beat with the other fundamental whose frequency is 500. If, however, two organ-pipes are sounded whose fundamentals are such that there are no beats except between the upper partials of high orders, the sensation should be a pleasant one; and such is observed. To secure such a condition it is evident that the ratios of the frequencies of the fundamentals must be simple fractions, 1 : 1, 1 : 2, 1 : 3, 2 : 3, 1 : 4, 3 : 4, etc. Such combinations of two notes produce what is called "harmony." On the other hand, whenever beats can be expected between two notes or their partials, or their combinational notes, an unpleasant sensation called "discord" is observed, it being possible to predict the degree of the discord from the number of beats which most occur. This explanation of harmony and discord is due to Helmholtz. The explanation of "melody," that is, the pleasant sensation perceived when notes, suitably chosen, are sounded consecutively, is not known definitely. (See, however, a paper by Sabine, American Association for the Advancement of Science, 1907.) For the discussion of the formation of musical scales based on these simple harmonies, see MAJOR; MINOR.

Limits of Hearing. Aerial waves of all wave-numbers do not affect the auditory nerves of the normal human ear, it being found by trial that wave-numbers less than 30 do not produce a musical tone, and wave-numbers exceeding about 20,000 do not produce sound at all. For musical purposes the extremes are about 40 and 4000. To study waves whose wave-numbers exceed 10,000 (and in fact for those of much less number) the best instrument is the "sensitive flame," which consists ordinarily of an ignited jet of gas escaping from a small circular orifice under high pressure, thus giving a more or less cylindrical flame about a foot high. When waves of a great wave-number fall upon such a flame, they break through the inclosing envelope separating the gas from the air, thus causing the jet to "flare" out like a fan.

Velocity of Sound. The waves produced in the air by vibrating bodies are often called "sound waves," although the name is not a good one. Similarly, compressional waves in any medium, solid, liquid, or gas, are called "sound waves" in these media. These waves spread out from the vibrating body into the surrounding medium with a velocity called the "velocity of sound," which depends alone upon the elasticity of the medium with respect to a compression and upon its density, if the medium is homogeneous. Like all waves, they may experience reflection, e.g., echoes; refraction, as when pass-

ing from cold air to hot air, or dense air to rare; dispersion; interference. Reference should be made to a paper by Prof. R. W. Wood in the *Philosophical Magazine*, vol. xlvi, p. 218, 1899, for a description of a most interesting series of experiments on these properties of aerial waves.

The best determinations of the velocity of these waves are given in the following table:

<i>Gases at 0° C.</i>			
Air (dry)	331.36	meters	per second
Hydrogen	1286.	"	" "
Oxygen	317.	"	" "
Carbon dioxide	262.	"	" "
<i>Solids and Liquids.</i>			
Aluminium ..	5104.	"	" "
Steel	4990.	"	" "
Glass, about ..	5500.	"	" "
Water	1435.	"	" "

The velocity of compressional waves varies greatly with the temperature. For a gas the velocity at t° C. equals that at 0° C. multiplied by

$$\sqrt{\frac{273 + t}{273}}$$

When waves pass from a region where the air is cold into one where it is warm, reflection takes place at the bounding surface, and thus the entering waves are not only refracted but also weakened in intensity. The presence of fog by itself in the air has very little effect upon the waves, unless there are currents or layers of hot or cold air. The velocity of waves in air is practically independent of the intensity of the vibration, although the waves produced by a sudden explosion travel at first slightly faster than do ordinary waves.

Acoustic Properties of Halls. When an organ-pipe or any elastic body is sounded in a room and then suddenly stopped, it is noticed that the sound does not instantly cease, but continues for several seconds. This is called reverberation; and the acoustic success of a room depends largely upon its duration. It should not exceed two seconds by more than a few tenths of a second if the room is to be used as a music hall or opera house. It is found that the reverberation in a given room is practically independent of the place where the vibrating body is situated, or of the position of the hearer; it depends upon the volume of the room, upon the material of the walls and floors, upon the cushions, the audience, etc., and to a certain extent upon the intensity of the sound. The following approximate formula has been developed by Professor Sabine of Harvard University:

$$(a + b_1 x_1 + b_2 x_2 + \text{etc.}) t = 0.164 V$$

Where a is a constant depending upon the absorbing power of the walls of the room.

b is a coefficient of "absorption" for one square meter of a definite material put anywhere in the room, the standard of comparison being the absorption of one square meter of open window.

x is the number of square meters of the material.

t is the duration of reverberation.

V is the volume of the room in cubic meters.

The absorption coefficients for some substances are as follows:

Hard pine wood sheathing	0.061
Plaster on wood lath	0.034
Plaster on wire lath	0.033
Audience (per square meter)	0.96
Isolated woman	0.54
Isolated man	0.48
Carpet rugs	0.20
House plants	0.11
Upholstered chairs	0.30
Hair cushions (per seat)	0.21

The duration of reverberation in certain music halls and auditoriums is as follows:

Old Music Hall, Boston, Mass.	2.44
Symphony Hall, Boston, Mass	2.31
Gewandhaus, Leipzig, Germany	2.30
Sanders Theatre, Cambridge, Mass.	3.42

Bibliography. Rayleigh, *Theory of Sound*, 2 vols. (London, 1896), a mathematical treatment, but with several descriptive chapters; Helmholtz, *Sensations of Tone*, translated by Ellis (London, 1895), the standard authority on harmony and music; Sabine, *Architectural Acoustics* (Boston, 1900), which contains the only satisfactory treatment of this important question; Thompson and Poynting, *Sound* (London, 1900), a text-book for schools and colleges and a storehouse of accurate information; Barton, *A Text-Book on Sound* (London, 1908); Sabine, *Architectural Acoustics* (Boston, 1906); Saeltzer, *Treatise on Acoustics in Connection with Ventilation* (New York, 1908), and Hamilton, *Sound and Its Relation to Music* (Boston, 1911).

ACQUI, ä'kwê (ancient *Aquæ Statiellæ*). An episcopal city of Piedmont, in north Italy, on the left bank of the Bormida, 37 miles north-west of Genoa (Map: Italy, C 3). Every winter more than 6000 persons take the cure at the hot and cold sulphur springs that gave it its name and for which it has been famous since ancient times. It has a Gothic cathedral of the twelfth century, a seminary, a college, and the ruins of a Roman aqueduct. The chief trade is in silk, lace, rope, and wine. Pop., 1901, 13,786; 1911, 17,000.

AC'QUISITION. In law, a term which has the double meaning of the acquirement of territory by the state, and of title to real or personal property by the individual. In the case of the state it is effected in three ways: (1) By occupation, (2) by treaty and convention, and (3) by conquest (q.v.). As referring to the origin of title to lands or goods, acquisition is either original or derivative. The former comprehends occupation, accession, and prescription or limitation (qq.v.); the latter, the more usual modes of acquiring title, as alienation by gift or sale, exchange, inheritance, and transfer by will (qq.v.). In the English and American law of real property the whole subject is dealt with under the head of **TITLE**. Consult Blackstone, *Commentaries on the Laws of England*; Kent, *Commentaries on American Law*.

ACQUIT'TAL (OF. *aquiter*, from Lat. *ad*, to + *quietare*, to quiet). In criminal law, the judicial discharge of the accused. It may result from some technical defect in the proceedings, or from a verdict in the accused's favor on the merits. In the former case it is not a bar to a second prosecution for the same offense; in

the latter case it is a bar, as well by common law as, in this country, by constitutional provision. See **AUTREFOIS ACQUIT** and **JEOPARDY**.

ACRA'NIA (Gk. *ἀ*, *a*, priv. + *κράνιον*, *kranion*, skull). A group of vertebrates having no skull or heart and represented only by the lancelets. See **AMPHIOXUS**.

ACRA'SIA (Gk. *ἀκρασία*, *akrasia*, intemperance). A beautiful enchantress in Spenser's *Faerie Queen*. Her name denotes her character. She dwells in a "Bower of Bliss," on a floating island of sensuous delight, and the fairy queen sends Sir Guyon to make an end of her seductive abode.

ACRA'TES (Gk. *ἀκρατής*, *akratēs*, intemperate). A male character in Spenser's *Faerie Queen*, typifying intemperance in the pursuit of pleasure.

ACRE, ä'kēr or ā'kēr. A word identical with Lat. *ager*, Gk. *ἀγρός*, *agros*, a field, and the Ger. *Acker*, which means both a field and a measure of land. Most nations have some measure nearly corresponding; originally, perhaps, the quantity a yoke of oxen could plow in a day; hence the word has a variable meaning.

The English statute acre consists of 4840 square yards. The chain with which land is measured is 22 yards long, and a square chain contains 22 × 22, or 484 yards; so that 10 square chains make an acre. The acre is divided into 4 roods, a rood into 40 perches, and a perch contains 30¼ square yards. The Scotch acre is larger than the English, and the Irish than the Scotch. One hundred and twenty-one Irish acres = nearly 196 English; 48 Scotch acres = 61 English. The following table shows the values of the more important corresponding measures compared with the English acre. The German *Morgen* below are becoming obsolete. The German Empire, Austria-Hungary, Spain, and Portugal have adopted the French metrical system.

English acre	1.00
Scotch "	1.27
Irish "	1.62
Austria, joch	1.42
Baden, morgen	0.89
Belgium, hectare (French)	2.47
Denmark, tönde land	5.05
France, hectare (= 100 ares)	2.47
France, arpent (common)	0.99
Holland, "	2.10
Naples, moggia	0.83
Portugal, geira	1.43
Prussia, little morgen	0.63
Prussia, great morgen	1.40
Russia, desiatina	2.70
Saxony, morgen	1.36
Spain, fanegada	1.06
Sweden, tunne land	1.13
Switzerland, faux	1.62
" Geneva, arpent	1.27
Tuscany, saccata	1.22
United States, English acre	1.00
Württemberg, morgen	2.40
Roman jugerum (ancient)	0.66
Greek plethron (ancient)	0.23

ACRE, ä'ker or ā'ker, or **ST. JEAN D'ACRE**. A seaport on the coast of Syria, a few miles north of Mount Carmel (Map: Turkey in Asia, F 6). It has about 11,000 inhabitants. The harbor is partly choked with sand, yet is one of the best on this coast. Acre is the *Accho* of the Bible, and has been known at

different periods as *Acco*, *Akka*, *Acon*, *Accaron*, and in Roman times *Ptolemais*. The town is of great antiquity; there is mention of it in hieroglyphic inscriptions as early as 1500 B.C. It was taken by the Assyrians under Sennacherib and given by Esarhaddon to the King of Tyre, with which it came subsequently into the possession of the Seleucid kings of Syria. The Romans made it a colony. In 638 the town was captured by the Arabs. In 1104 it was taken by the Crusaders; in 1187 it was recaptured by the Sultan Saladin, and in 1191 fell once more into the hands of the Crusaders, and became the seat of a bishop and of the Order of St. John. It was the last stronghold of the Crusaders in Palestine, being surrendered to the Saracens in 1291, after an obstinate defense by the crusading orders. In 1517 it was captured by the Turks. In 1799 it was besieged by the French under Napoleon Bonaparte for 61 days, but was successfully defended by the garrison, aided by a body of English sailors and marines under Sir Sidney Smith. In 1832 it was stormed by Ibrahim Pasha, son of the Viceroy of Egypt, and continued in his possession till it was bombarded and taken in 1840 by a combined English, Austrian, and Turkish fleet. See EGYPT; SELEUCIDÆ.

ACRE, ä'krä. A territory of Brazil, formerly belonging to Bolivia. See BOLIVIA; BRAZIL.

ACRES, ä'kërz, BOB. A character in Sheridan's *Rivals*. He appears as a somewhat rustic gentleman, of bombastic manners and ludicrous cowardice, noted particularly for what he calls his "oath referential" or "sentimental swearing."

ACRI, ä'krè. A city in Calabria, south Italy, 13 miles northeast of Cosenza (Map: Italy, L 8). The neighboring country is beautiful, healthful, and fertile, and produces olives, fruit, and cotton. Pop., 1901, 13,132; 1911, 13,306.

ACRID'IDÆ. See GRASSHOPPER.

ACRISIUS, ä-krish'ï-üs. See DANAÆ.

ACRO. See HELENIUS ACRO.

AC'ROBAT (Gk. one walking on tiptoe, from *ἄκρος*, *akros*, highest + *βαίνειν*, *bainein*, to go). Originally it was doubtless used to denote the acrobatic feats of the rope-dancers, but in the course of centuries its meaning has extended so that it includes many things which were unknown to the Greeks and Romans as familiarly as were the rope-dancers, who, as Terence in his prologue to *Hecyra* complains, distracted the attention of the republic from his play; and so does history repeat itself, a writer in the *Tatler* expresses his surprise at finding so small an audience at the opera, because the rope-dancer was not in the bill that night. The most recent celebrated exponent of the original art was Blondin (q.v.), who crossed Niagara Falls on a rope, carrying a man on his back. But this was no unheard-of feat, for when Isabel of Bavaria, Queen to Charles VI of France, made her entry into Paris, says Froissart, who was an eyewitness, a cord was stretched from the highest house on the bridge of St. Michael to the topmost gallery of the Church of Our Lady and an acrobat carried two boys holding lighted candles over it. From being a rope-dancer, or rather balancer only, the acrobat gradually added to his exhibits other balancing and tumbling acts. Vaulting and juggling and contortions became part of the entertainments of the Middle Ages. Edward III paid jugglers handsomely for exhibiting their acrobatic skill

and the flexibility of their bodies. The austere Queen Mary even relaxed at their pranks; and when Queen Elizabeth attended the revels at Kenilworth Castle, which Sir Walter Scott has immortalized, she was vastly entertained by acrobatic tumblers. Even the wonderful balancing feats of the Japanese with ladders at right angles, up and down which a second man climbs in apparent defiance of the laws of equilibrium, had their prototypes, if not equals, among the European acrobats of 200 years ago, while modern somersault-throwing and leaping through hoops are illustrated in manuscripts as far back as the fourteenth century. The more liberal interpretation of the word now includes performances on the trapeze, the horizontal bar, and the other pieces of apparatus usually found in gymnasiums for the development of the suppleness of the body. Consult Le Roux and Garnier, *Acrobats and Mountebanks*, translated by A. P. Morton, illustrated (London, 1890); Lamb, *Hand Balancing and Tumbling* (Springfield, Mass., 1912); *Tumbling for Amateurs*, "Spalding Athletic Library" (New York, published annually).

AC'ROCERAU'NIA (literally, 'Thunder-Heights,' from Gk. *ἄκρος*, *akros*, highest + *κεραυνός*, *keranos*, thunderbolt). The north-western promontory of Epirus, which forms the termination of the Ceraunian, or Acroceraunian, Mountains. It was a dangerous point for sailors, on the regular route from Brundisium to Dyrrachium (Horace, *Odes*, i. 3. 20), and was named from the frequent thunderstorms that occurred there. It is the modern Cape Glossa.

AC'ROCORIN'THUS (Gk. *Ἄκροκόρινθος*, *Akrokorinthos*). A steep hill about 1900 feet in height which was the citadel of ancient Corinth, and is still crowned by ruined Byzantine fortifications. The hill commands a superb view, famous even in ancient times, of the mountainous districts on both sides of the Corinthian Gulf. See ACROPOLIS; CORINTH.

ACROLEIN, ä-krö'lè-in (Lat. *acer*, sharp + *olere*, to smell), C₂H₃CHO. A colorless liquid having an extremely irritating odor. It is produced in the incomplete combustion of fats and when ordinary glycerin is distilled with sulphuric acid or other dehydrating agents. Some acrolein is produced when fats are overheated in cooking, and when the wick of a candle just blown out is left smoldering. Its reactions show that it contains the atomic group CHO; it is, therefore, classed with the aldehydes. Bromine adds itself directly to acrolein, forming an "additive product" of the composition, C₂H₃Br₂CHO; which shows that acrolein must be classed with the *unsaturated* organic compounds. By the action of barium hydroxide solution upon this acrolein dibromide, Emil Fischer (q.v.) and Tafel obtained glycerose (glyceraldehyde with some dioxy-acetone), and the latter in turn was changed by lime-water into a mixture of sugars. From this mixture Fischer and Tafel were able to obtain inactive fructose (*α*-acrose), one-half of which is identical with ordinary fructose or fruit-sugar. This is celebrated as one of the earliest cases of the synthetic reproduction of a natural sugar.

AC'ROLITHS (Gk. *ἄκρον*, *akron*, extremity + *λίθος*, *lithos*, stone). Greek statues, of which the head and extremities were of stone and the draperies of wood, either gilded or otherwise adorned. They did not belong exclusively to the earliest period of Greek sculpture, as has

been supposed, but were also made during the best periods of the art. They were a less expensive substitute for chryselephantine (q.v.) sculpture.

AC'ROMEG'ALY (Gk. *ἄκρος*, *akros*, highest, extreme + *μέγας*, *megas*, great). A rare chronic disease, characterized by a gradual and permanent enlargement of the head, hands, and feet associated with disordered function of the pituitary gland. It was first described in 1886 by Marie. It occurs in both men and women, beginning generally in the third decade of life. Some pains and functional disturbances, as well as anæmia, accompany its onset. Both soft tissues and bones are enlarged, the lower jaw, tongue, lips, and nose being very greatly hypertrophied. The hand sometimes reaches 8 inches in length, the foot 12 inches, while the circumference of the head may reach 26 inches. Acromegaly is now known to be due to overgrowth of the hypophysis or pituitary gland. In autopsies the gland is found either merely hypertrophied, or the seat of a malignant tumor, or a cyst. The disease has an interesting association with gigantism. According to Sternberg 40 per cent of giants are victims of acromegaly, and 20 per cent of acromegalics are over 6 feet in height when the symptoms begin. See article by Dock, in Osler's *Modern Medicine*, vol. vi (New York, 1910).

A'CRON (Gk. *Ἄκρων*, *Akrōn*). A physician of the fifth century B.C., native of Agrigentum in Sicily. Tradition says that he successfully combated the great plague in Athens in 430 B.C. by building large fires to purify the air. The Empiricists claimed him as the father of their school. His medical works are wholly lost.

ACROP'OLIS (Gk. *ἄκρος*, *akros*, highest + *πόλις*, *polis*, city). Originally the fortified refuge of a district, usually containing the palace of the chief. For this purpose a natural stronghold was selected and strengthened by artificial defenses. Around the acropolis a city frequently arose. When this was defended by a wall, the acropolis sometimes lost its military character and was given over to temples, as having been the centre of the oldest cults. The acropolis of Athens is the best example of this change and is also the most celebrated. (See ATHENS.) Other noteworthy acropolises were the Larissa at Argos, Acrocorinthus at Corinth, Mount Ithome in Messene, and the Cadmea at Thebes. In the older sense the name was frequently applied to any fortified hill commanding an ancient site, as at Troy, Mycenæ, Tiryns, Pergamum, Priene, etc.

AC'ROPOL'ITA, GEORGIUS (1217-82). A Byzantine historian and statesman, born at Constantinople. He was trusted with important diplomatic missions at an early age, and in 1244 he was made great *logothete* ('chancellor'). Having been sent to Pope Gregory X in 1282, he brought about the reconciliation of the Greek and Latin churches. His principal work is his *Annales*, comprising a history of the period from the capture of Constantinople in 1204 to its recovery by Palæologus in 1261. A complete edition of his works was published in 1903. Consult Karl Praechter, "Antikes in der Grabrede des Georgios Akropolita," in *Byzantinische Zeitschrift*, vol. x (1905).

ACROS'TIC (Gk. *ἄκρον*, *akron*, extremity, end + *στίχος*, *stichos*, line, verse). A Greek term for a number of verses, the first letters of which follow some predetermined order,

usually forming a word—most commonly a name—or a phrase or sentence. Sometimes the final letters spell words as well as the initial, and the peculiarity will even run down the middle of the poem like a seam. Sir John Davies composed 26 *Hymns to Astrea* (Queen Elizabeth), in every one of which the initial letters of the lines form the words Elisabetha Regina.

In the acrostic poetry of the Hebrews the initial letters of the lines or of the stanzas were made to run over the letters of the alphabet in their order. Twelve of the psalms of the Old Testament are written on this plan. The 119th Psalm is the most remarkable. It is composed of 22 divisions or stanzas (corresponding to the 22 letters of the Hebrew alphabet), each stanza consisting of eight couplets, and the first line of each couplet in the first stanza beginning in the original Hebrew with the letter *aleph*, in the second stanza with *beth*, etc. The divisions of the psalm are named each after the letter that begins the couplets, and these names have been retained in the English translation. With a view to aiding the memory, it was customary at one time to compose verses on sacred subjects after the fashion of those Hebrew acrostics, the successive verses or lines beginning with the letters of the alphabet in their order. Such pieces were called *Abecedarian Hymns*. Acrostic verse, however, has never been highly regarded by the great men of letters, many of whom actually despised it.

AC'ROTE'RIUM (Gk. *ἀκρωτήριον*, *akrōtērion*, the summit or extremity). A plinth or base



ACROTERIUM.

for an ornamental appendage above any one of the three angles of a classic pediment or gable; also the ornament or appendage with its base. The most common form of ornament for acroteria was the anthemion; in early Greek and Etruscan examples painted on terra cotta or marble, in later and more perfect buildings carved in relief in marble, a full anthemion at the apex of the gable, a half-anthemion at its extremities. Occasionally figure-subjects in relief and even groups of figures, and symbolic forms like griffins, occur in place of the anthemion ornaments. See ANTHEMION.

ACT (Lat. *actus*, the doing or performing of a thing; *actum*, a public transaction, record). A term of law applied to the written expression of the will of the legislature formally declared. As commonly employed, it is synonymous with statute (q.v.). The term is derived from the *acta* of Roman public life, which comprehended all public official procedure as well as the official record thereof. An act of one legislature cannot tie the hands of its successors, unless it amounts to a contract, so that its repeal would come

within the constitutional prohibition of legislative acts which impair the obligation of contracts. In England even this exception does not exist, each Parliament being an absolutely sovereign legislature. Still, certain acts of Parliament have been passed in the hope, if not with the intention, of arresting "the possible course of future legislation"; and some of them have commanded a respect almost equal to that accorded in this country to written constitutions. To this class belong the Bill of Rights (q.v.); the Act of Settlement (12 and 13 Will. III, c. 2) fixing the descent of the crown; the Acts of habeas corpus (q.v.); the Acts of Union with Scotland (1 James I, c. 1), and with Ireland (39 and 40 Geo. III, c. 67); and the Septennial Act of 1716 limiting the life of a Parliament to seven years. "Act" is used in connection with other words in a number of familiar phrases. For example, *act of honor*, the acceptance by a stranger of protested paper for the honor of some party thereto; *act of God*, an inevitable accident resulting from superhuman causes, such as lightning, tempest, or floods; *act of state*, act done or commanded by the government of a foreign state, for which the person injured has no redress in the courts of his own country, but must seek redress through the diplomatic agencies of his government.

ACT. In the drama, the name for one of the principal parts of a play. In performance the acts are commonly separated by intervals, during which the dropped curtain conceals the stage. An act which may in turn be subdivided into scenes should be in a certain sense complete in itself, and at the same time should form an essential part of the whole drama. As every dramatic plot naturally divides itself into three parts—the exposition, the development, and the conclusion or catastrophe—a division into three acts seems most natural; but practically this would often require undue condensation, and the well-known classic custom defined by Horace in his *Ars Poetica* is that a play should be in five acts. Normally, the first act indicates the general nature of the drama, introduces the characters, and begins the action. The second act leads up to the third, which develops the crisis of the plot. In the fourth the conclusion or catastrophe is prepared, but should by no means be anticipated so as to weaken the effect of the *dénouement*, which is reserved for the fifth act. The Greeks, who always strictly observed the unities, did not make the formal distinction of acts in their drama, but their tragedies are subjectively capable of division into parts or episodes, which are practically separated by the lyrical parts of the performance. (See CHORUS.) In modern drama the requirement for five acts began early to be neglected, especially in comedy. (See MOLIÈRE.) On the present stage plays are common in any number of acts below five. The four-act play is most common. Consult: Archer, *Play-Making: A Manual of Craftsmanship* (London, 1912), and Matthews, *A Study of the Drama* (Boston, 1910).

ACT, or CEREMONY OF "INCEPTION." The commencement or degree-taking exercises generally carried on in mediæval universities and, in modern times, in most German universities and at Oxford and Cambridge. The ceremony was completely abolished at Oxford in 1856, while Cambridge still retains a much modified form of it. In both, however, various phrases associated with this mediæval custom—such as

"Act Sunday" and "Act Term"—are still in use. In America *the Act* was practiced in colonial days. The student or "respondent" who "keeps the act" reads a thesis in Latin which he defends against three "opponents" named by the proctors. In a quaint pamphlet on *New England's First Fruits*, published in 1643, there is an account of the late commencement at Harvard in which the word "acts" is familiarly employed, as one may see from the following extract: "The Students of the first Classis that have beene these foure yceres trained up in University-Learning for their ripening in the knowledge of the Tongues and Arts, and are approved for their manners, as they have kept their publick Acts in former yearcs, our selves being present at them, so have they lately kept two solemne Acts for their Commencement, when the Governour, Magistrates, and the Ministers from all parts, with all sorts of Schollars, and others in great numbers were present, and did heare their Exercises."

All that now survives of this complex ceremony in American educational institutions is but the faintest suggestion in our commencement exercises, held by secondary and even elementary schools as well as by colleges and universities. See COMMENCEMENT.

ACTA. Among the Romans the public acts or orders of a magistrate, as distinct from the doings of a general, which were called *gesta* or *res gestæ*. (See ACT.) At the close of a magistrate's term, his *acta* were submitted to the Senate for approval or rejection. After the death of Julius Cæsar the triumvirs swore, and compelled all other magistrates to swear, to maintain all his *acta*. Each new Emperor swore to respect the *acta* of his predecessor, unless the latter had been branded with infamy after death. On January 1st each magistrate, on taking office, swore to maintain the *acta* of the reigning Emperor. The term *acta* came in time to be synonymous, in effect, with the English "Records"; for the word in this sense, see ACTA DIURNA; ACTA MILITARIA; ACTA SENATUS. The various *acta* were much used by the Roman historians.

ACTA DIURNA, POPULI, URBANA, URBIS, or PUBLICA (acts daily, popular, municipal, or public). A sort of daily chronicle of events published in ancient Rome, giving summaries of the principal legal and political orations, the decisions of the courts, news from the army, and the latest official gossip of the town. They seem also to have contained extracts from the *Acta Senatus*, accounts of the transactions of the assemblies of the people, news of all sorts relating to the Imperial family, accounts of births, deaths, marriages, and divorces, accidents, prodigies, and the like, all of which were preserved as sources of future history. When Antony offered Cæsar a crown on the feast of the Lupercalia, Cæsar ordered it to be noted in the *Acta Diurna*. The *Acta* are frequently said to have been introduced by Julius Cæsar (Suetonius, *Cæsar*, 20), but others believe them to have existed long before Cæsar's time, and to have supplanted the *Annales* (see ANNALS), which fell into disuse about the year 131 B.C. The Latin scholar Hübner advanced strong arguments in support of the former view, although it was the practice before Cæsar's time for scribes to compile a manuscript chronicle of public events in the city of Rome, which was often forwarded with private letters to absent friends. In any case, Cæsar gave added importance to the *Acta*

Diurna; they were thenceforth published more or less under the authority of the government and with its aid: in imperial times they were under the control of a bureau directed by a *procurator*, or imperial agent. The *Annales* took note only of the most important events, whereas matters of far less importance were included in the *Acta Diurna*. The material for the *Acta* was gathered by reporters called *actuarii*, and the *Acta* were exposed in public places to be read or copied by any who chose to do so. (See ALBUM.) After a reasonable period of time they were taken down and preserved with other public documents. Persons in Rome were accustomed to keep their friends who were sojourning out of town informed of the progress of events and of the news generally, as gathered from the *Acta Diurna*. A passage in Petronius (cap. 53) gives an imitation of the *Acta*. From this it would appear that the style was very simple and that only the bare facts were stated. Consult Le Clerc, *Des journaux chez les Romains* (Paris, 1838), a treatise to be read with caution, and Hübner, *De Senatus Populique Romani Actis* (Leipzig, 1860). See also ACTA; ACTA MILITARIA; ACTA SENATUS.

ACTÆ'A (Gk. ἀκτέα, *aktea*, elder tree). A genus of six species belonging to the family Ranunculaceæ, three of them occurring in the United States. *Actæa rubra* is the "red baneberry" or "black cohosh," while *Actæa alba* is the "white baneberry." They are perennial herbs, with large compound leaves, small white flowers in terminal racemes, and red or white berries. *Actæa spicata* of Europe has purplish-black berries and is often called "herb-Christopher."

ACTÆ'ON (Gk. Ἀκταίων, *Aktaiōn*). A mythical personage, a grandson of Cadmus, trained as a hunter by Chiron. Having offended Artemis, he was changed by her into a stag and torn in pieces by his own dogs. The sin by which Actæon offended Artemis is variously stated. According to Euripides, in the *Bacchæ*, Artemis was jealous because Actæon had boasted that he excelled her in hunting. The most popular version in later times was that he had come upon the virgin goddess while she was bathing.

ACTA E'RU'DITO'RUM (Lat. Proceedings of the Learned). A Latin monthly and the first German literary serial (117 vols., 1682-1782). It was founded by Prof. Otto Mencke of Leipzig, and was owned by his family till 1754, after which it rapidly deteriorated. The series contains a record of the progress of science to 1776. Consult Sandys, *A History of Classical Scholarship*, vol. ii (Oxford, 1906), and Ornstein, *The Rôle of the Scientific Societies in the Seventeenth Century* (New York, 1913).

ACTA MAR'TYRUM (Lat. Acts of the Martyrs). A name given by the ancient Church to the records of the trials and deaths of the martyrs which were kept for the edification of the faithful. The oldest extant refer to the death of St. Ignatius of Antioch, who died about the year 107. St. Augustine (fifth century) speaks of these records as being read to the people on their festival days. Eusebius, the Church historian (died about 340), collected the *Acta Martyrum* in his two works, *De Martyribus Palæstinæ* and *Synagoge Martyrum*, the latter of which has perished, but the former is the appendix to the eighth book of his *Church History*. See McGiffert's trans. (New York,

1890); Delehaye, *Legends of the Saints* (English trans., London, 1907).

ACTA MIL'ITA'RIA. A record of the duties, numbers, and expenses of each legion and of the property owned by each soldier, kept by soldiers, who are mentioned in inscriptions as *libraii legionis*, *actuarii legionis*, or *tabularii legionis*.

ACTA PILA'TI (Lat. Acts of Pilate). An account of the trial and death of Jesus Christ, purporting to have been written by Pontius Pilate or under his direction. Although Justin Martyr (Apol., i, 76-86), Tertullian (Apol., v, 21), and Eusebius (ii, 2) allude to some account rendered by Pilate to the Emperor Tiberius, the *Acta* now extant in the Vatican library, as well as the so-called *Report* of Pilate to the Emperor and the alleged *Epistolæ Pilati* describing the resurrection, are admittedly spurious. Consult Lipsius, *Die Pilatusacten* (Kiel, 1871). Various English translations have been published, e.g., *Acta Pilati* (Shelbyville, Ind., 1879), and also one in the Ante-Nicene library.

ACTA SANCTO'RUM, or **MAR'TYRUM** (Lat. Acts of the Saints or Martyrs). The collective title given to several old writings respecting saints and martyrs in the Greek and Roman Catholic churches, but now applied especially to one extensive collection begun by the Jesuits in the seventeenth century, and intended to serve as a better arrangement of the materials found in ancient works. This great undertaking, which was commenced by the Jesuit Heribert Rosweyde, of Antwerp, has considerable importance, not only in a religious and ecclesiastical point of view, but also with regard to history and archæology. After Rosweyde's death in 1629, Johannes Bolland was commissioned by the order of the Jesuits to continue the work, and with the assistance of Godfried Henschen he prepared two volumes, which appeared in 1643. After the death of this editor (1665) the work was carried on by a society of learned Jesuits, who were styled "Bollandists," until 1794, when its further progress was prevented through the invasion of Holland by the French. In recent times the undertaking has been resumed, and in 1845 the fifty-fourth volume was published at Brussels. Many additional volumes have appeared since. The lives are arranged in the order of the calendar. A new edition of the first fifty-four volumes appeared in 1863-69. The sixty-fifth volume appeared in 1892. For notices of other and similar collections, see SAINTS; MARTYR; MARTYROLOGY.

ACTA SENA'TUS, or **COMMENTARII**, kôm'en-tā'rī-ī, **SENA'TUS**. A record of the transactions of the Roman senate, including the opinions of the chief speakers, and the final decision of the senate. From an early time the proceedings of the senate had been written out by a committee of senators, under the direction of the magistrate who had presided; these records were deposited in the *Ærarium* (q.v.). They were regularly published after 59 B.C., every day, under governmental authority, from notes of short-hand writers. Augustus forbade their publication, but the records were, of course, still kept by one of the senators selected by the Emperor.

ACTIAN, äk'shan, **GAMES**. See ACTIUM.

ACTINIA'RIA (Gk. ἀκτίς, *aktis*, ray). A group of anthozoan cœlenterates comprising the sea-anemones. They differ from all other anthozoans in the complete absence of a skeleton

and in the large size of the individuals, which rarely form a colony. See ANTHOZOA and SEA-ANEMONE.

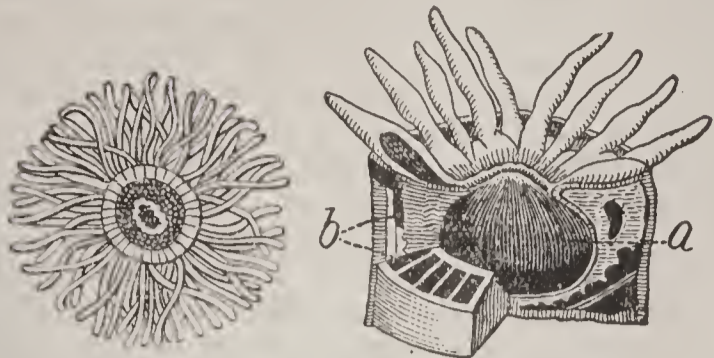


FIG. 1.

FIG. 2.

ACTINIARIA.

1. Vertical aspect of an Actinarian, showing mouth and tentacles. 2. Sectional view: *a*, simple digestive sac; *b*, structure of the body-wall, showing septa.

ACTINIUM. A radioactive element discovered by Debierne in 1899. It occurs along with other radioactive substances in pitchblende and is chemically very similar to thorium, but is characterized by its high power of emanation. In 1902 Giesel discovered another substance, likewise possessing a high power of emanation, but chemically similar to lanthanum; he called it *emanium*. The question has since arisen whether actinium and emanium are not identical. Investigations carried out by Debierne, Miss Brooks, and Hahn and Sackur seemed to indicate that the two substances are identical. But a careful study led Marckwald, in 1905, to the remarkable conclusion that actinium and emanium are not identical, but are closely related to each other, inasmuch as *actinium is being continually produced from emanium*. Perhaps the most interesting fact about actinium is that, like radium, it is decomposing with the formation of the element helium, although actinium and radium are chemically very different substances. See RADIOACTIVITY.

ACTINOGRAPH (Gk. *ἀκτίς*, *aktis*, ray + *γράφειν*, *graphein*, to write). An instrument for recording automatically the chemical effects of radiations from any source, especially the sun. The simplest forms of actinograph are those that expose standard photographic plates or films (iodides, chlorides, or bromides of silver) to the sun's action for short, definite periods of time. Those that utilize the union of chlorine and hydrogen under the influence of light, or the precipitation of gold from a solution of gold chloride and oxalic acid on exposure to light, cannot be readily employed for automatic registration. See SUNSHINE RECORDER.

ACTINOLITE (Gk. *ἀκτίς*, *aktis*, ray + *λίθος*, *lithos*, stone). A calcium-magnesium-iron amphibole (q.v.) that includes the varieties nephrite, asbestos (q.v.), smaragdite, and uralite. Actinolite varies in color from a bright green to a grayish green, and usually occurs in the form of long, slender crystals in metamorphic rocks, commonly in talc.

ACTINOLITE-SCHIST. See AMPHIBOLITE.

ACTINOMETER (Gk. *ἀκτίς*, *aktis*, ray + *μέτρον*, *metron*, measure). An instrument for measuring the effect of the sun's rays in producing chemical, i.e., actinic effects. As originally devised by Sir John Herschel, this title was applied by him to a thermometer whose bulb was filled with a blue solution of ammonia and sulphate of copper; the expansion of this solution by absorbing the sun's rays was supposed to measure the quantity of blue light or

chemical rays in the beam of sunshine. The name has since been loosely applied to two distinct types of apparatus. In one of these the sensitive element acts like a black body and absorbs practically *all* the radiation of whatever wave-length; in the other type selective absorption takes place, and therefore partial effects due to radiation of only certain particular wave-lengths are measured. It is desirable that instruments of the first class, measuring the gross radiation of all wave-lengths, be called pyrheliometers. Instruments sensitive to certain selected radiations, such as cause photographic, chemical, and other like changes, should be called actinometers, since these changes are commonly designated as actinic effects. In this case the radiation selectively absorbed does molecular work of a chemical nature and is measured by these effects, as when a mixture of chlorine and hydrogen is converted into hydrochloric acid and the quantity of acid that is formed in years of time is the measure of the intensity. This includes the basis of the methods of Draper and Bunsen and Roscoe. When a mixture of ferric-oxalate and chloride of iron dissolved in water is exposed to sunshine, it gives out carbonic acid gas; this is the basis of Marchand's apparatus. A photographic plate exposed for a short time receives an impression whose intensity may be measured on a scale of tints or shades and made the basis of a determination of the intensity of the sunshine. This method has been worked out by Bigelow and others. In general, any apparatus for measuring the chemical effects of radiation from any source constitutes an actinometer, properly so called. See PYRHELIOMETER.

ACTINOMETRY. The general subject of the measurement of either the relative or the absolute effect of solar or other radiation. A consistent usage would restrict the word to measurements of only actinic effects, i.e., chemical, photographic, and other like reactions. Nevertheless both thermal and visual phenomena are sometimes comprised under this title. See ACTINOMETER.

ACTINOMORPHY (Gk. *ἀκτίς*, *aktis*, ray + *μορφή*, *morphē*, form, shape). In botany, a term of symmetry used chiefly in connection with flowers. In an actinomorphic flower the members of each set are similar and arranged about a common centre, as are the parts of a radiate animal. If there are five petals, they are alike and are evenly distributed about the centre of the flower, as are the spokes of a wheel about the hub. Technically defined, an actinomorphic flower is said to have as many planes of symmetry as there are members in a cycle. This means that if an imaginary plane be run through each sepal or petal or stamen and the common centre, the two resulting halves of the flower will be similar. More commonly such flowers are spoken of as "regular." See FLOWER.

ACTINOMYCOSIS (Gk. *ἀκτίς*, *aktis*, ray, beam + *μύκης*, *mykēs*, mushroom, fungus, excrescence), LUMPY JAW or BIG JAW. A specific, infectious disease produced by a parasitic micro-organism known as the ray fungus (*Actinomyces bovis*). The micro-organism causes the formation of deep subcutaneous tumors or swellings, which break down and suppurate. The disease is usually of sporadic occurrence, but sometimes becomes epidemic. It is most

frequently found in cattle, but affects also horses, pigs, sheep, deer, llama, guanaco, and man. Actinomycotic tumors in cattle have been recognized since 1825, although they have frequently been mistaken for cancerous, tuberculous, or syphilitic tumors. The disease was first definitely described in cattle by Böllinger in 1877, and in man by James Israel. It occurs in all parts of Europe and North and South America. The ray fungus is found in all tumors and abscesses of this disease, wherever situated, and its presence may be detected by examining the small yellow masses discharged in the pus. These consist of aggregations of the ray fungus, readily detected under the microscope. In cattle the seat of the disease is usually in the inferior maxillary bones, submaxillary salivary glands, in the tongue, pharynx, and œsophagus. The common names, Big Jaw, Lumpy Jaw, Big Head, and Wooden Tongue, are descriptive of the most frequent forms of actinomycosis in cattle and horses. In hogs actinomycosis is found in 80 per cent of cases in the udder. In a small percentage of cases the lungs and intestines are affected. Maxillary tumors in cattle are almost invariably due to the ray fungus, and therefore actinomycosis may be readily diagnosed.

Considerable difference of opinion prevails regarding the systematic position of the ray fungus. It has been supposed that the organism has a plant host on which it passes part of its life cycle. The agency of various grasses (especially such as have sharp-pointed awns) in transmitting actinomycosis can hardly be questioned. Many cases of this disease in man have been reported, the greater number having occurred as a result of eating raw meat.

The most effective treatment is the internal administration of potassium iodide, advocated by Thomassen in 1885. Abscesses, where accessible, must be opened and drained, and treated with antiseptics. Actinomycosis follows a slow, chronic course.

The relationship of the disease to the public health has been much discussed. Apparently infection most frequently takes place in man and cattle through diseased teeth or abrasions of the mucous membrane of the mouth. The identity of actinomycosis in man and cattle is admitted, but most authorities hold that its direct transmission to man through eating the meat of affected animals is of rare occurrence. Whether an animal affected with actinomycosis should be used for human food is a question. It may be safely asserted that animals in which the disease has become generalized should be condemned. For details concerning actinomycosis, consult D. E. Salmon, "Investigations Relating to the Treatment of Lumpy Jaw, or Actinomycosis, in Cattle," *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin 2* (Washington, 1893); D. E. Salmon and others, "Special Report on Diseases of Cattle and on Cattle Feeding," *Report of U. S. Department of Agriculture for 1904, Bureau of Animal Industry* (Washington, 1904); "Tumeurs des mâchoires observées dans l'espèce bovine," *Journal de Médecine Vétérinaire* (Paris, 1826). A full description of human actinomycosis is found in Osler's *Modern Medicine*, vol. i (New York and Philadelphia, 1910).

ACTINOTHERAPY. The treatment of disease by means of actinic or chemical rays. It is now known that the entire spectrum, from

the long wave-length and slow frequency of the infra red to the short wave-length and high frequency of the rays beyond the violet, produces chemical changes. The action on the organism varies with the wave-length and the frequency of the ray employed, but the short high frequencies beyond the violet are the ones most active therapeutically. See PHOTOTHERAPY.

ACTINOZO'A. Same as ANTHOZOA (q.v.).

ACTION (Lat. *actio*, a doing, performing, an action, suit, process). A term which, in its broadest sense, includes every lawful proceeding in a court of justice for the enforcement or protection of a right, the redress or prevention of a wrong, or the punishment of a public offense. Formerly the term was confined, in English law, to an ordinary proceeding in a common law court, while the word "suit" was applied to a proceeding in equity. By the reformed procedure in many of our States, all distinction between actions at common law and suits in equity, as well as between the different forms of common law actions, have been abolished, and only a single civil action is recognized. The earliest classification of common law actions was: (1) real actions, or those based on the plaintiff's right of property in specified lands, so called because the *res*, or property itself, was sought to be recovered; (2) mixed actions, such as those in ejectment or for waste, in which not only the possession of the land but damages also for its wrongful use or abuse are sought; (3) personal actions, or those against a particular person for a money judgment. The distinction between real and personal actions is the foundation of the classification of property as real and personal. (See PROPERTY.) This third class was subdivided into actions *ex contractu*, such as debt (q.v.) and covenant (q.v.), and actions *ex delicto*, such as trespass (q.v.) and detinue (q.v.). Again, actions are divided into local and transitory, according as they must be brought in a certain county or State, or as they may be brought wherever the defendant is found. An action for trespass to land is local, and it must be brought in the State where the land is situated; while an action for slander of title (q.v.) to that land is transitory. (See the authorities referred to under the various titles above named.)

ACTION. In psychology, a term used broadly to cover all forms of muscular movement. We speak, e.g., of the action of the heart, or reflex action, etc., as well as of impulsive or voluntary action. There is, however, a growing tendency to reserve the word "action" for such bodily movements as have conscious antecedents and concomitants (movements for which there are conscious motives, and of which we are conscious, as they run their course in time), and to employ the general term "movement" for movements which are of an unconscious, purely physiological, character. We shall therefore speak in this article of impulsive and voluntary *action*, but of reflex *movement*.

The problem which action sets to psychology is twofold. We have, in the first place, to trace the genesis and development of action; and in the second to analyze the active consciousness, to determine the constituent processes in the various forms of motive.

1. There are two opposed theories of the genesis of action. The first asserts that all conscious actions have developed from reflex movements. The reflex movement is the direct

and definite response of the organism to a particular stimulus. A frog whose brain and medulla have been removed will draw up its leg if the foot be pinched; the pupil of the human eye contracts under the influence of light, and expands again as the light is diminished. Mechanical and unconscious movements of this kind are, the theory holds, older than consciousness. When mind appears, it finds such movements ready to its hand; it avails itself of them for conscious purposes. So the animal's movements, at first automatic and simple, grow more and more complex, and have more and more of the element of consciousness imported into them. The main arguments for the position are as follows: (a) Spontaneous movements are to be observed in children and young animals: movements that are neither reflex movements nor voluntary actions, but random discharges of the excess of energy stored in the healthy organism. These movements furnish a varied supply of active experience, certain items of which must, by the law of chance, prove to be positively pleasurable, while others will at least be less unpleasant than the experiences preceding them. Whenever active experience and pleasure are thus coincident, attention is drawn to the movement, which is elaborated into voluntary action. (b) From the physiological point of view, the movements of the lowest organisms, as well as the movements carried out by means of the lower nerve-centres of higher organisms, are of the reflex type. And even the most complex of voluntary actions can be assimilated to this type on the neural side; for the physical correlate of such action is simply the reflex arc, with its central portion made longer and more circuitous.

Neither of these arguments is, however, free from objections. In the first place, different observers differ as to the range and scope of the spontaneous movements of infancy. Some restrict them within very narrow limits, where the play of chance coincidence would be inconsiderable; others assert that they can, one and all, be reduced to incipient voluntary actions and imperfect hereditary reflexes. Moreover, the theory presupposes that the sensations and perceptions aroused by moving appear, in point of time, before the pleasure achieved by the movement or the voluntary impulse toward it. But this means that mind is built up piecemeal, whereas there is reason to think that consciousness is a single tissue, every strand of which is given with every other. Again, it is difficult to understand the mechanism by which pleasurable movements are selected. Granted that a movement chances to bring pleasure, how is its repetition brought about? Can we form any clear idea of the way in which a motive is prefixed to the sensation series? Against the second argument, it is asserted as evident that the simplest form of sensory-motor coördination need not be the earliest. There is a primitive simplicity, but there is also a simplicity of reduction and refinement. Again, the statement that the movements of the lowest organisms are reflex in character is said to beg the question: the original theory assumes outright that there is a strict parallel between the growth of the race and the growth of the individual, between phylogeny and ontogeny, and does not take into account the fact that the individual comes into the world endowed with a rich inheritance of neuro-muscular coördinations. And, lastly,

even if the neural substrate of voluntary action be in structure no more than a highly complex reflex arc, still the opponents of the theory point out functional differences: the reflex is unconscious, while the functioning of the central cells of the voluntary arc is accompanied by consciousness. So we come face to face once more with our original problem.

The alternative theory, which we may now examine, affirms that the earliest organic movements are, in principle, voluntary actions. Mind, according to this theory, is as old as life, and the first movements of living matter are impulsive actions, i.e., actions prompted by a single determining motive. The arguments which this position brings into the field are as follows: (a) All reflex and instinctive movements show signs of adaptation; they subserve a particular end or purpose; they are definite and appropriate responses to certain circumstances of the animal's environment. Now, in the first place, primitive movements should be vague and purposeless; it is not easy to conceive of a movement that should be at once rudimentary and economical. And, in the second place, it has been argued that the presence of mind in a living creature is the creature's capacity of adaptation, of learning. The reflex, pointing as it does to a process of adaptation in the past, points also to the existence of a past mind. In a word, reflex movements appear to be degenerate, mechanized impulsive actions. (b) There can be no doubt that such mechanization is possible. We are constantly in the course of our every-day life reducing voluntary actions to "secondary reflexes": our pen dips itself in the accustomed inkstand, our coat buttons itself, our bicycle balances itself, without any of the conscious attention that we gave them when the movements were new. Further, what we see happening here in the course of a few days or weeks has happened also in the life of the race. We wince when we are ashamed, and jump when we are startled; and the jump and wince are inexplicable unless they are the degenerate descendants of voluntary actions, the last reflex remnants of the cowering and shrinking and leaping aside of the frightened animal.

The only question which this second point of view leaves unanswered is the mode of origin of the first impulse. How and under what conditions the primeval organism became conscious of the impulse to move, and organic movement appeared in the natural world, we cannot say. But neither is psychology called upon to say. No science explains its own data; it takes them for granted. As, therefore, the physicist assumes the mechanical universe, and the biologist the phenomena of life, so may the psychologist assume without cavil the existence of mind. A theory, however, has recently been proposed which not only resolves this difficulty, but also affords a possible reconciliation of the two opposed theories outlined above. Both of these presuppose, at least by implication, that the organism had no past. In fact, while we must believe that life is derived from the non-living, organic from inorganic, we are yet not bound to believe that the transition was abrupt. On the contrary, it is probable that nature made many essays at life before a stable, self-sustaining life was struck out; that there were many intermediate stages between the vital and non-vital, many imperfect modes of half-life or part-life which were in-

stable and therefore transient, but which none the less bridged the gulf between the inanimate and the animate worlds. Hence the first living thing may have had a past, a half-vital ancestry; and this past would have done for it, in a crude way, precisely what our ancestry does, in an infinitely more complicated way, for ourselves. In other words, when life was finally achieved, the organism had a background of "experience" both for the reflex movement (tropism) and for the conscious impulse, and the first movements were therefore both tropic and conscious. This theory does not conflict with the general doctrine of organic evolution; it avoids the postulation of an abrupt break between organic and inorganic life; and, finally, it allows the advocates of the first theory a tropic explanation of many primitive movements and, at the same time, admits of the presence of consciousness at the first moment of what we now know as life.

Whatever be the truth in these speculations, the psychologist has the right to his conscious starting-point, from which the rest follows easily enough. For psychology the first organic movement is an "action upon presentation," an action whose motive (the impulse) is given with the presentation to the animal of a pleasantly or unpleasantly toned stimulus. Out of this grows impulsive action proper, an action whose motive is blended of three ideas: that of the stimulus, the original motive-idea; that of the result of movement, of pleasurable accomplishment; and that of the moving itself, the "active experience" of the first theory. The course of development beyond impulsive action takes two directions. Upward, toward greater mentality, it rises to the more complex forms of voluntary action: to selective action, in which there is a conflict of impulses, a period of deliberation, resulting in the victory of some one (the actual) motive over other less strong (potential) motives; and to volitional action in which the conflict is not between impulse and impulse, but between an impulse to movement on the one hand and a group of ideas prompting to no-action on the other. Downward, toward less mentality, the impulsive action degenerates into the reflex movement. Selective and volitional action, as we have seen, may also degenerate; choice and resolve become automatic; the complex action slips back, first of all into an impulsive act, and finally into a secondary reflex. Note the light which this view of the development of action throws upon the problems of animal psychology (q.v.). Bethe thinks that ants and bees are automata, while popular psychology dowers them with all sorts of conscious motives and purposes. Now, ants and bees prove, on trial, to be unintelligent; they cannot learn to make new adaptations. On the other hand, the adaptations which they have already learned are of an extremely complicated character. It has been assumed, therefore, by certain authorities that these creatures represent the final stage in a retrogressive development from a fairly high level of mentality. According to this theory popular psychology is right, in that ants and bees once possessed a good deal of mind; it is wrong in interpreting their present movements as voluntary actions. If it be objected that the unicellular organisms, the most primitive forms of life, should (on the present theory) show signs of rudimentary impulsive action, and that

they prove, on trial, to be as automatic as Bethe's ants, the reply may be that these protozoa, simple as they are, have as long a line of ancestry as we have ourselves; and that the less mind there is to start with, the less will be the fall from impulse to the reflex. But many qualified observers deny this total absence of mind. In general, then, it is asserted by the supporters of this hypothesis that if a sound view of mental evolution is to be attained, the investigator must accept the idea that all animals have had mind. Whether or not they have it now depends upon the direction which their development has taken—upward, toward physiological adaptability and elaboration of mental process, or downward, toward specific adaptation and the lapse of consciousness.

2. We have already said something by way of analysis of the "typical" motive to action, the impulse. The essential thing, however, in every action-consciousness is its predetermination in the sense of an idea of end. (See DETERMINING TENDENCY.) If, now, we attempt a further analysis of the impulse, we get something like this: a preliminary phase in which the prominent things are kinæsthesia and the idea of end or result—either of which may carry, in consciousness, the determination; a central phase in which some object is apprehended in relation to, or in the sense of, the idea of end, i.e., the apprehension of the object releases the determining tendency and the movement occurs; and a final phase in which the perception of result is set on a background of kinæsthesia, of the sensations aroused by the actual movement. The affective accompaniment of all this group of ideas may be pleasurable or unpleasurable, but must always be the one or the other; we may jump for joy or from fright, but we do not jump when our mood is that of indifference. The essential thing in the active consciousness, however, is an apperception of (attention to) some one of the ideas contained in the motive. (See APPERCEPTION; ATTENTION.) (a) In the case of primitive action (action upon presentation) we must suppose that the idea of object is the idea that stands in the focus of attention; the impulsive action is indistinguishable from the movement that expresses emotion. (See EXPRESSION; EXPRESSIVE MOVEMENTS.) "The universal animal impulses—the impulses of nutrition, of revenge, of sex, of protection, etc.—are indubitably the earliest forms of emotion" (Wundt). The hungry animal perceives food: its attention is held by this perception; it is pleasurable moved by the perception; and bodily movement toward the food-supply results. (b) As the organism grows in experience of movement, the impulse becomes more complex, and the focus of attention shifts to the idea of our own movement (action upon representation); so that we may lay it down as a law of analytical psychology that the condition of voluntary action is an apperception of the movement-idea. We think of ourselves as moving, and find that we have moved. (c) At a still later stage, when the voluntary action is taking the downward path toward the secondary reflex, the idea of movement fuses with the idea of result into an indissoluble whole. It is now the idea of result that holds the attention. We feel a draught, and rise at once to close the window, thinking neither of the object of movement, the window, nor of the muscular move-

ments that take us to it, but simply of the result of the action, the avoidance of a cold. So the emphasis shifts from term to term of the threefold complex; from idea of object to idea of movement, and from that again to idea of result. But the motive remains in principle the same thing: an affectively toned group of sense-material, given in the state of attention.

The conscious antecedents of the higher forms of voluntary action are naturally more complicated. In place of the triad of simple ideas we have, in the conflict of impulses that precedes volitional and selective action, elaborate systems or constellations of ideas, representations of the total "situation" in which we find ourselves. In place of the simple pleasantness or unpleasantness of the impulse, we have equally elaborate affective formations—emotions and sentiments; the feelings of obscurity, of contradiction, of resolve, of decision; the characteristic oscillatory emotion of doubt; the emotions of relief, of satisfaction or dissatisfaction, of hope, of disappointment; the sentiments of power, of pride, of æsthetic fitness, of moral rightness. (See EMOTION.) And in place of the passive attention which the single impulse-motive commands, we have an active, effortful attention divided among the various potential motives contained in the "situation." It is the business of descriptive psychology to unravel the processes of these motive-consciousnesses, and to trace the single pattern (the impulse pattern) that runs through them all. It is the business of experimental psychology to examine the impulse under standard conditions; to build it up from the given elements, and to construct artificial, selective and volitional actions from a number of simple impulses. This task it accomplishes by aid of the reaction experiment. Consult: A. Bain, *The Emotions and the Will* (London, 1899); H. Spencer, *Principles of Psychology* (New York, 1890); W. Wundt, *Vorlesungen über die Menschen- und Tierseele* (5th ed., Leipzig, 1911; trans. as *Human and Animal Psychology*, London, 1901); id., *Grundzüge der physiologischen Psychologie* (6th ed., Leipzig, 1910-11); N. Ach, *Ueber die Willenstätigkeit und das Denken* (Göttingen, 1905).

ACTIUM, äk'shī-üm, now AKRI. A town and promontory on the west coast of Greece at the entrance of the Ambracian Gulf, now the Gulf of Arta. It is memorable for the sea fight which took place near it Sept. 2, 31 B.C., between Octavius (afterward the Emperor Augustus) and Marcus Antonius. These two had for some time ruled the Roman world jointly, the former in the west, the latter in the east. It now came to a struggle for the sole sovereignty. The two armies were encamped on the opposite shores of the gulf. Octavius had 80,000 infantry, 12,000 cavalry, and 260 ships of war; Antony, 100,000 infantry, 12,000 cavalry, and 220 ships. Antony's ships were large and well provided with engines for throwing missiles, but clumsy in their movements; Octavius's were smaller and more agile. Antony was supported by Cleopatra (q.v.), Queen of Egypt, with 60 vessels, who induced him, against the opinion of his most experienced generals, to risk a naval engagement. The battle continued for some hours undecided; at last Agrippa, who commanded Octavius's fleet, succeeded by a skillful manœuvre in compelling Antony to extend his line of battle, the compactness of which had hitherto resisted all attempts of the enemy to

break through. Cleopatra, whose ships were stationed behind Antony's line, apprehensive that his line would be broken, took to flight with her auxiliary fleet, and Antony recklessly followed her with a few of his ships. The deserted fleet continued to resist bravely for some time, but was finally vanquished; the land army, after waiting in vain seven days for Antony's return, surrendered to Octavius. As a memorial of the victory that had given him the empire of the world, and out of gratitude to the gods, Octavius enlarged the temple of Apollo of Actium, dedicated there the trophies he had taken, and instituted games (*Ludi Actiaci*) to be celebrated there every five years. He also built on the spot where his army had been encamped the town of Nieopolis ('City of Victory'), near where Prevesa now stands. The battle of Actium is described in Greek by Plutarch (*Life of Antony*) and by Dion Cassius (book i). See ANTONIUS, MARCUS; AUGUSTUS; CLEOPATRA.

ACT OF FAITH. See AUTO-DA-FÉ.

ACT OF PARLIAMENT, pär'li-mënt. A resolution or law passed by all the three branches of the English legislature, the King (or Queen), lords, and commons; or, as it is formally expressed, "by the King's Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in Parliament assembled, and by the authority of the same." An act of Parliament thus made is the highest legal authority acknowledged by the constitution. It binds every subject, and, with a few exceptions, every alien in the land, and even the sovereign himself, if named therein. And in England it cannot be altered, amended, dispensed with, suspended, or repealed but in the same forms and by the same authority of Parliament. In Scotland, however, a long course of contrary usage or of disuse may have the effect of depriving a statute of its obligation; for by the Scotch law a statute may become obsolete by disuse and cease to be legally binding. It was formerly held in England that the King might in many cases dispense with statutes, especially such as were of a penal character; but by the statute 1 W. and M., st. 2, c. 2, it is declared that the suspending or dispensing with laws by royal authority without consent of Parliament is illegal.

An act of Parliament is either public or private. A public act regards the whole Empire or one of its main subdivisions, in which case it is *general*; or a subordinate part, in which case it is *local*; but the operation of a private act is confined to particular persons and private concerns. As the law till lately stood, the courts of law were bound *ex officio* to take judicial notice, as it is called, of public acts, i.e., to recognize these acts as known and published law, without the necessity of their being specially pleaded and proved; but it was otherwise in regard to private acts, so that in order to claim any advantage under a private act it was necessary to plead it and set it forth particularly. But now, by the 13 and 14 Vict. c. 21, s. 7, every act of Parliament is to be taken to be a public one, and judicially noticed as such unless the contrary be expressly declared.

An act of Parliament begins to operate from the time when it receives the royal assent, unless some other time be fixed for the purpose by the act itself. The rule on this subject in Eng-

land was formerly different, for at common law every act of Parliament which had no provision to the contrary was considered as soon as it passed (i.e., received the royal assent) as having been in force retrospectively from the first day of the session of Parliament in which it passed, though in fact it might not have received the royal assent, or even been introduced into Parliament, until long after that day; and this strange principle was rigidly observed for centuries. The ancient acts of the Scotch Parliament were proclaimed in all the county towns, burghs, and even in the baron courts. This mode of promulgation was, however, gradually dropped as the use of printing became common, and in 1581 an act was passed declaring publication at the Market Cross of Edinburgh to be sufficient. British statutes require no formal promulgation, and in order to fix the time from which they shall become binding it was enacted by 33 Geo. III, c. 13, that every act of Parliament to be passed after April 8, 1793, shall commence from the date of the indorsement by the clerk of Parliament stating the day, month, and year when the act was passed and received the royal assent, unless the commencement shall in the act itself be otherwise provided for.

Acts of Parliament are referred to by the year of the sovereign's reign, and the chapter of the statutes for that year. They were first printed in the reign of Richard III, originally in Latin, but since the fourth year of Henry VII in English. The collective body of such acts constitute the Statutes of the Realm. See STATUTE; PARLIAMENT, and the authorities there referred to.

ACT OF SETTLEMENT. The second chapter of statute 12 and 13 William III of Great Britain (1701), which provided that the crown, in default of issue to Anne Stuart, William's presumptive successor, should descend to the House of Hanover, and which excluded Roman Catholics from the throne. See ELIZABETH STUART (Queen of Bohemia).

ACT OF UNIFORMITY. The English statute of 13 and 14 Car. II, c. 4 (1662) which provides that the Book of Common Prayer, as then recently revised, should be used in every parish church and other place of public worship in England, and that every school-master and person instructing youth should subscribe a declaration of conformity to the liturgy, and also to the effect of the oath and declaration mentioned in the act of 13 Car. II, st. 2, c. 1. It further enacted that no person should thenceforth be capable of holding any ecclesiastical promotion or dignity, or of consecrating or administering the sacrament, till he should be ordained priest according to Episcopal ordination, and with respect to all ministers who then enjoyed any ecclesiastical benefice it directed that they should, within a certain period, openly read morning and evening service according to the Book of Common Prayer, and declare before the congregation their unfeigned assent and consent to the use of all things therein contained, upon the pain of being deprived of their spiritual promotions. Two thousand of the clergy who refused to comply were deprived of their preferments. Acts to secure uniformity were passed under Edward VI (1549) and Elizabeth (1559). See PRAYER-BOOK, COMMON.

ACTON, ăk'ton. A residential suburb of London, England. During the civil wars it was one of the strongholds of Puritanism, and has been at various times the place of residence of

many famous personages, such as King Henry III, the great jurist Sir Matthew Hale, the novelist Henry Fielding, and the actress Mrs. Barry. Pop., 1891, 24,200; 1901, 37,744; 1911, 57,523.

ACTON, JOHN EMERICH EDWARD DALBERG, first BARON (1834-1902). A distinguished historian and the foremost Roman Catholic layman of the nineteenth century in England. Acton was born in Naples—his father an English baronet, his mother a German heiress, his maternal grandfather a prominent French diplomat. He was educated under Dr. (afterward Cardinal) Wiseman at St. Mary's Oscott and, since Cambridge as yet refused degrees to Roman Catholics, at the University of Munich. Here Acton, escaping the deadening influence of English classicism, steeped himself in French, German, Italian, and Spanish literature and history; here also he formed a lifelong friendship with Dr. Döllinger, the distinguished leader of the liberal Catholic party in Germany. The first of these circumstances made Acton a great modern historian; the second caused him to become the head of the Liberal Catholic movement in England. Acton now traveled; visited America, France, and Russia; returned home; entered Parliament, and represented Carlow in the House of Commons for six years.

It was, however, as an editor and historian that Acton became distinguished. In 1858 he succeeded Newman as editor of *The Rambler*, a brilliant Catholic review. Written by laymen for laymen, the journal was both bold and critical. "I am sick of men who are afraid of a scandal," wrote Acton at one time, and *The Rambler* under his direction developed a fearlessness that was highly displeasing to many of the English Roman Catholic clergy. Acton was an enemy of ultramontanism, a foe to papal infallibility, an enthusiastic supporter of Döllinger and the Old Catholic movement in Europe; and in history he found his armory for the conflict. Book reviews and contributed articles poured forth from his pen, scientific, scholarly, truthful. In 1862 *The Rambler* was changed into *The Home and Foreign Review*, a quarterly. Two years later it was discontinued—the reason, a papal rescript aimed at Döllinger and the German Liberals. This pronouncement of the Pope Acton could not approve. "If it is accepted by *The Home and Foreign*," he wrote, "the review loses its identity and the very breath of its nostrils." On the other hand, he would not oppose the edict of the Holy See. The journal, therefore, abruptly ended. Acton, like Erasmus, whom he resembled in many ways, preferred to work from within the church. He retained his independence, refused to bow the knee to Cardinal Manning, and in 1874, in a series of letters to *The London Times*, contended vigorously against papal infallibility.

As he grew older, he turned more and more toward the study of history. Here he was indefatigable, as upward of 500 book reviews, 50 special articles and essays, and numerous published lectures bear ample witness. From 1895 to his death he was regius professor of modern history at Cambridge and while there planned the well-known *Cambridge Modern History*. "Our scheme," he wrote in regard to this work, "requires that nothing shall reveal the country, the religion, or the party to which the writer belongs." And this advice to others was exemplified in the impartiality and fairness of

his own writings. Among them, published since his death, are *Lectures in Modern History* (1906); *The History of Freedom and other Essays* (1907); *Historical Essays and Studies* (1907); *Lectures on the French Revolution* (1910). A complete list of his writings may be found in a bibliography edited by W. A. Shaw for the Royal Historical Society (1903).

Consult *Letters of Lord Acton to Mary Gladstone* (1904); James Bryce, *Studies in Contemporary Biography* (1903).

ACTON, Sir JOHN FRANCIS EDWARD (1737-1811). Prime Minister of Naples under Ferdinand IV. He was born at Besançon, France, the son of an English physician. He served in the Tuscan navy, commanding a frigate in the expedition against Algiers in 1775. He showed such ability that he was invited to reorganize the Neapolitan navy, and soon became commander-in-chief of the sea and land forces, then minister of finance, and finally prime minister. His measures were intolerant, and ultimately caused a reaction against the royal family of Naples and in favor of the French party and the Carbonari. When the French entered Naples in 1806, he fled to Sicily, where he died.

ACTON, THOMAS COXON (1823-98). An American financier and administrator. He was born in New York City and served as assistant deputy county clerk (1850-53) and as deputy register. He was a police commissioner of the New York metropolitan police in 1860-69, and during the last seven years was president of the board. His most valuable service while in that office was during the draft riots in 1863, when for a week he personally commanded the entire police force of the city.

ACTORS' CHURCH ALLIANCE OF AMERICA. An organization founded in 1899 by Walter E. Bentley, a Protestant Episcopal clergyman who had been an actor. Its purpose is the establishment of closer relations between the church and the theatre. It provides chaplains of all denominations to minister to the needs of the dramatic profession, and agitates against Sunday performances and other evils of the stage. The Alliance is affiliated with the Actors' Church Union of England, an organization with similar purposes. The membership of the Alliance is about 5000. It has on its rolls about 1500 chaplains in over 400 cities.

ACTS, SPURIOUS or APOCRYPHAL. See APOCRYPHA, *New Testament*.

ACTS OF HOSTILITY. Acts which may involve nations in war. In international law the term is also applied to the acts of force, authorized by the laws of war, employed by one belligerent against another, during the continuance of war. Acts of hostility may be of a diplomatic, commercial, civil, or military character. The angry nature of the French Ambassador's (Count Benedetti, q.v.) interview with the King of Prussia at Ems in 1870 is an example of a hostile diplomatic act. The French embargo on British ships after the Peace of Amiens (q.v.) is an example of the commercial phase; the firing at an armed vessel of a friendly nation, or the invasion of territory, is a military example; and the detention of non-belligerents, citizens of a friendly nation, as in the case of France and England (1803), is an example of a civil act of hostility. See INTERNATIONAL LAW.

ACTS OF PILATE. See ACTA PILATI.

ACTS OF THE APOSTLES (Gk. Πράξεις

τῶν Ἀποστόλων, *Praxeis tōn Apostolōn*). The fifth book of the New Testament, the composition of which is ascribed by tradition and by the general consent of critics to the same author as that of the Third Gospel, to which book it forms a sequel. As the Gospel was written after the destruction of Jerusalem (70 A.D.), the date of Acts is still later, being not before 75 A.D., and possibly not after 95 A.D., though, if the author of the Gospel was acquainted with the *Antiquities* of Josephus (written 93-94 A.D.), the composition of Acts must be dated somewhat after 95 A.D. In view, however, of the rather doubtful argument for such acquaintance, a date for Acts in the neighborhood of 80 A.D. is not unlikely. Its place of composition is not possible to determine. Its purpose is apparent from the plan on which its material is selected and arranged, when compared with the declared purpose and evident plan of its antecedent book. (See LUKE, GOSPEL OF.) It is to place before Theophilus, who was either a convert from paganism, or, if yet a pagan, well on the way toward an acceptance of Christianity (see THEOPHILUS), the successful extension of the religion of Jesus from its old life in Judaism to its new life in Gentilism as providentially directed and so originally intended by its divine founder. Six stages in the Church's life and work are disclosed, each marked by a summarizing statement (vi. 7; ix. 31; xii. 24; xvi. 5; xix. 20; xxviii. 31). There may have been a secondary purpose, to show, by the favorable reception and treatment which this religion received from Roman officials, that there was no disposition on the part of the government to consider Christianity in a hostile light. Such a secondary purpose would be the more likely if Theophilus were yet himself a pagan and the book were composed in the early Flavian period, when Christianity was under imperial suspicion (see PERSECUTIONS OF THE CHRISTIANS), and would serve an additional purpose by placing in strong contrast the blind hostility of Judaism against the Church.

The abrupt ending of the narrative (xxviii. 30, 31) would seem to imply that it was in the author's mind to write a third book, describing Paul's release and subsequent labors until his death, or perhaps the fortunes of the other apostles.

The material of the book is derived partially from outside sources, both oral (e.g., the information derived from Philip, at Cæsarea) and written (e.g., the speech of Stephen), the presence of which is specially evident in the first twelve chapters, which treat of the experience of the early Church in Jerusalem and Judæa, and partially from personal notes of the missionary experiences of Paul and his companions (e.g., as given in the diary sections xvi. 10-17; xx. 5-15; xxi. 1-18; xxvii. 1-xxviii. 16). These notes were taken, as the critical facts in the case would seem to make clear, by the author himself, who thus becomes a companion of Paul. As to the identity of this companion there would seem to be no valid reason against the uniform tradition from Irenæus downward that he was Luke, mentioned in Paul's Epistles as standing in close relationship to the apostle. (See Col. iv. 14; 2 Tim. iv. 11; Philem. verse 24.) This is the opinion of Harnack in his recent work, *Luke the Physician*, Eng. trans. (London, 1907) and is coming to be more generally the judgment of modern

scholars. From the New Testament references it is apparent that Luke was a Gentile, though not a Roman citizen, of probable Macedonian origin and Antiochian residence and a physician by profession.

Two schools of criticism have attempted to disparage the credibility of Acts—the Tübingen School (1845), which held it to be a tendency writing, so manipulating the narrative in the interests of the union movement of the Church in the second century as to destroy all accuracy of facts, and the Documentary School (1890), which held it to be a complex composite writing, made up of such variant documents, of such varied origins, and of such differing degrees of reliability as hopelessly to obscure the actual facts of the history. Neither of these attempts has proved successful. Later there has been an effort among critics to subject it to the same process of literary criticism as has been so largely employed in the Old Testament. This presents it as a writing which not only gives us a history of the early times of which it tells, but in the way in which it gives that history so reflects the later times in which it was written as to give us a picture of its own age. By these critics it is held to be a composite writing of not earlier origin than the reign of Domitian (81–96 A.D.), compiled by a Gentile Christian, not Luke nor any companion of Paul, and, outside of the personal diary sections in the latter half of the book, which may have come from Luke, of no necessary historical accuracy.

Present criticism, however, is disposed to assign a higher historical value to the narrative of the book. The peculiar accuracy with which the author uses his political terms, especially in view of the frequent changes which took place in the political relations of the provinces to the Emperor and the senate, the preciseness of his knowledge of localities, his intimate acquaintance with the development of the early Church, both internal and external, and his apparent familiarity with the life and work of Peter and Paul, as disclosed in the undesigned agreement in his narrative with the Epistles—all these contribute to the conclusion that the author was writing in first-hand contact with the events which he records, and more than offset the difficulties which arise from the uncertainty of his reference to Theudas (v. 34–39) and from the confusion as to his statement of the terms of the decree of the Apostolic Council (xv. 28–29).

Professor Blass of Halle has suggested that it was written originally in two texts—a longer and a shorter one, the former being the earlier and represented in the text of the peculiar Codex Bezae (D), the shorter being the later and represented in the canonical text of the Testament. But the smoothness of the Bezan text of Acts would suggest that it represents a later (second century) revision of the original text by one who was intimately acquainted with the Asia Minor localities described.

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ACTUARIAL SOCIETY OF AMERICA.

An organization for the promotion of actuarial science. It was founded in 1889 and in 1912 had 140 fellows and 110 associates.

ACTUARY (*Actuarius*, in ancient Rome, meant a clerk who recorded the *acta* (q.v.) of the senate and other public bodies, and also an accountant). In recent times, a term applied to officers of life insurance companies and cognate enterprises who supply the calculations as to the probable duration of life upon which insurance contracts, annuities, etc. are based. See INSURANCE; PROBABILITIES.

ACUNA DE FIGUEROA, FRANCISCO. See FIGUEROA, FRANCISCO ACUNA DE.

ACUPRES'SURE (Lat. *acus*, needle + *pressura*, pressure). A mode of arresting hemorrhage from bleeding vessels, now obsolete. A

needle is passed through the tissues on either side of the vessel, so as to cross over and compress it, just as in putting a flower in the lapel of one's coat one crosses over and compresses the flower-stalk with a pin pushed twice through the lapel.

AC'UPUNC'TURE (Lat. *acus*, needle + *punctura*, a pricking). A very ancient remedy, practiced extensively in the east, for the relief of pain, swelling, or dropsy. Steel needles about 3 inches long, set in handles, are used. The surgeon passes one or more to the desired depth in the tissues, and leaves them there from a few minutes to an hour. The relief from pain afforded by this simple operation is sometimes astonishing, and the wounds are so minute as to be perfectly harmless if the needles are aseptic. The needles are sometimes used as conductors of the galvanic current for the destruction of moles, birthmarks, etc., and are sometimes made hollow to permit the injection of a small quantity of some sedative solution into the tissues, by which pain may be almost immediately relieved. See NEURALGIA.

ADA. A city and the county-seat of Pontotoc Co., Okla., about 75 miles (direct) southeast of Oklahoma City, on the St. Louis and San Francisco, the Missouri, Kansas, and Texas, and the Oklahoma Central railroads (Map: Oklahoma, E 4). It is the seat of the State normal school. Its principal industries include the manufacture of cement and asphalt, and cotton raising. Ada is situated in an agricultural and mineral region and produces a large amount of hardwood timber. The municipality owns its water works and has adopted the commission form of government. Pop., 1900, 3257; 1910, 4349; 1913 (est.), 6000.

ADA, öd'ö. A town of Bacs-Bodrog, a county of the Kingdom of Hungary, situated on the Theiss, about 30 miles south of Szegedin (Map: Hungary, G 4). The inhabitants are engaged chiefly in the cultivation of grain and in raising cattle. Pop., 1900, 12,112; 1910, 12,500.

ADAD. See HADAD.

ADAGIETTO, ä'dä-jët'tö. See ADAGIO.

ADAGIO, ä-dä'jō (It. slowly, leisurely, from *adagio*, at ease). In music, primarily a slow tempo intermediate between *largo* or *grave* and *andante*. The term is further applied to the slow movement (usually the second) of a musical composition, as, e.g., of a symphony, sonata, concerto, or overture. It serves as a contrast with the rapid and energetic preceding (*allegro*) and following (*scherzo*) movements of the work and affords scope for a flowing and expressive slow melody with a gracefully varied accompaniment, which breaks up the monotony of the adagio and heightens its effect. A clear and expressive execution of an adagio is an unfailing test of the artistic standing of a performer, as it demands a pure and beautiful tone and calls for variety of tonal color. The diminutive *adagietto* is no longer used as denoting a tempo slightly more animated than adagio, but as a generic title for a short adagio movement.

ADAIR, ä-där', JAMES (1735-75). An Indian trader and author. He lived for almost 40 years among the southern Indians, chiefly among the Chickasaws, and in 1775 published a valuable work entitled *The History of the American Indians, Particularly Those Nations Adjoining the Mississippi, East and West Florida, Georgia, South and North Carolina, and Virginia*. Though

impaired in value by the author's zealous advocacy of the Jewish origin of the Indian race, this book gives one of the best first-hand accounts ever written of the habits and character of the native tribes, besides containing an incomplete but valuable vocabulary of various Indian dialects. Adair's theory of the origin of the Indians was adopted and elaborated by Dr. Elias Boudinot in his *Star of the West, or An Attempt to Discover the Long-Lost Tribes of Israel* (1816).

ADAIR, JOHN (1759-1840). An American soldier. He was born in Chester Co., S. C., but removed to Kentucky in 1787. He served as major in General St. Clair's Indian expedition of 1791 and was defeated by "Little Turtle" in November. He was a member of the Kentucky Constitutional Convention (1792) and was a United States Senator from 1805 to 1806. He served as volunteer aid to General Shelby in the battle of the Thames (Oct. 5, 1813) and, as brigadier-general of militia, commanded the Kentucky troops at New Orleans in 1815. He was Governor of Kentucky (1820-24) and a member of Congress (1831-33).

ADAIR, ROBIN. See ROBIN ADAIR.

ADAL, ä-däl'. A narrow tract of land in East Africa extending along the Red Sea from the Gulf of Tajura to Massawa. The larger part is included in the present Italian colony of Eritrea (q.v.), while the southern end, bordering on the Gulf of Tajura, is under the protectorate of France. Its inhabitants are the Danakil, a warlike people of dusky complexion, crisped hair, and professing Mohammedanism.

AD'ALBERT (?-1072). A German prelate. He was made Archbishop of Bremen in 1043 by Henry III, whom he accompanied to Rome, where he declined the proposed candidacy for the papacy when he might have been elected. Leo IX made him his legate in the North. During the minority of Henry IV Adalbert and Archbishop Hanno, of Cologne, usurped the administration of the Empire; but he became obnoxious to the princes, and they succeeded in separating him from the Emperor. He soon after regained his influence, however, and kept it as long as he lived. His dream was to unite Germany, England, and Scandinavia into a patriarchate independent of Rome.

ADALBERT (?-997), SAINT. A Bohemian prelate improperly styled "the apostle of the Prussians," whose original Bohemian name was Voitech ('comfort of the host'). He was educated at Magdeburg, and in 983 was chosen Bishop of Prague, but soon wearied of the perpetual strife with the essentially heathen Bohemians and retired to a monastery near Rome. He went back to Prague in 992, but again retired in discouragement and finally went as a missionary to the Poles and Prussians and was murdered by a heathen priest April 23, 997. He was first buried at Gnesen and then transferred to Prague and put in a vault, where his bones were discovered in 1880 and deposited in the cathedral. For his life, consult C. Heger (*Königsberg*, 1897), H. G. Voigt (Berlin, 1898).

ADALIA, ä-dä'lē-ä (ancient Attalia). The chief seaport of the Turkish vilayet of Konieh, situated on the southern coast of Asia Minor, in lat. 36° 52' N., long. 30° 45' E., about 200 miles southeast of Smyrna (Map: Turkey in Asia, D 4). The streets rise like the seats of a theatre up the slope of the hill and are studded with beautiful gardens of orange, fig, and mul-

berry trees. It has a considerable trade in timber, wheat, and other agricultural products. Modern steamers cannot enter the harbor, and for this reason its importance has been greatly lessened. Pop., about 30,000, including about 7000 Greeks.

AD'AM. The name given in the Book of Genesis to the first man. The word *Adam* is originally a common noun applied both to a single human being and to mankind in general; hence, as a designation for the first man the Old Testament almost invariably attaches the article to *adam*, which thus becomes *ha-adam*; that is, 'the man.' There are two accounts in Genesis of the creation of man—one in i. 20-30, and another in ii. 5-24. According to the former, male and female are created at the same time (i. 27). The passage is somewhat ambiguous, so that it is not certain whether only a single human pair is referred to or mankind in general, just as according to this version the animal world in general is created at the beginning. In the second version, however, a single male individual alone is formed by God, who molds a man out of the "dust of the ground" and breathes into the mass the "breath of life" (ii. 7). The word used for "ground" is *adamah*, and in the mind of the writer there is evidently a close connection between this word and *Adam*. A common meaning for the Hebrew root *adam*, from which *adamah* is derived, is 'red'; but while this furnishes a satisfactory explanation for the word "ground," it does not follow that the implied etymology for *adam* as man is correct. The root *adam* occurs in several Semitic languages and exhibits a variety of meanings, such as 'pleasant,' 'to make,' 'to attach one's self' (hence, 'to be sociable'), and scholarly opinion vacillates between assuming one or the other of these significations as furnishing the explanation of the name "Adam." If any conclusion may be drawn from *ben* or *ibn*, which is the common Semitic word for 'son' and 'child,' and which is derived from a root signifying 'build,' the weight of evidence would be in favor of connecting *adam* with 'to make.' In Assyrian we have a word *admu* (the equivalent of the Hebrew *Adam*), which actually occurs as one of the synonyms of 'child' (see Delitzsch, *Assyrisches Wörterbuch*, p. 25). Of more importance, however, is the similarity of the name to that of the Babylonian hero Adapa. It is possible that the last sign *pa* also had the value *ma*, or that Adama was a Palestinian variant of Adapa. (See ADAPA.) The two stories of creation in Genesis differ in many respects (see CREATION), but it is by the combination of the two that we obtain the views held by the Hebrews regarding the first man. In the first version, where the work of creation is distributed among six days, humanity is created on the last day. Man is made in the image of God, and given dominion over all the animals and, indeed, the entire earth. In the second version it is stated that man was placed in a garden situated in Eden (Gen. ii. 8), known as the "Garden of Eden," in which all manner of trees were planted. (See EDEN.) Man is put there to till the ground and to keep guard over it. He is permitted to eat of the fruit of all the trees with the exception of one, known as the "tree of knowledge of good and evil," which he is not to touch under penalty of death. A woman is created as a helpmate to Adam out of one of his ribs. She is called Eve, a name subsequently explained as "the mother of all living."

The close attachment between Adam and Eve (see EVE) is emphasized, and, although not distinctly stated, the narrative implies that she is included in the prohibition not to eat of the one tree singled out. Through the serpent, who assures the woman that she and Adam will not die, the woman is beguiled into eating of the fruit and gives of it to Adam. The first consequence of the act is that the pair recognize their naked state and make loin coverings of fig leaves. Adam pleads in extenuation that the woman gave him of the fruit, and the woman pleads that the serpent beguiled her. All three are punished, the serpent by becoming the cursed one among the animals, the woman by increase of her troubles and pain, particularly in child-bearing, and the man by being obliged henceforth to secure his sustenance by the sweat of his brow in tilling the ground. God makes garments of skin for the pair, and in fear lest they eat also of the "tree of life" which is in the garden and whose fruit imparts immortality, he drives Adam and Eve out of their first habitation and places cherubim (q.v.) with flaming swords to guard the way to the tree of life.

In the continuation of the narrative (chap. iv, 1-2), the birth of two sons, Cain and Abel, is recounted; but beyond that we learn nothing further of Adam and Eve until we reach a passage inserted in chap. v from a work called *Sefer Toledoth Adam*, or 'The Book of the Generations (or History) of Mankind.' It contains a genealogical list in which, after a restatement of the creation of humanity and the assigning of the name Adam (Gen. v. 2) to *mankind in general*, the birth of Seth, in the 130th year of Adam's life, is recounted, no mention being made of Cain or Abel. Adam is said to have died at the age of 930 years, after having begotten sons and daughters. This genealogical list appears to be in reality a list of dynasties, drawn up on the basis of a tradition which belongs to the same category of semi-legendary lore as the lists preserved by Eusebius and Syncellus of early Babylonian rulers who lived before the Flood (see Rogers' *History of Babylonia and Assyria*, vol. i, p. 328), and one of Sumerian origin that has recently been discovered among the tablets from Nippur in the museum of the University of Pennsylvania by Dr. Arno Poebel. On the other hand, the story of Adam and Eve in the first three chapters of Genesis is a composite production embodying various popular tales or myths, some elements of which probably go back to Babylonia. Having passed through an independent development among the Hebrews, they have been interpreted in the light of the monotheistic conception of the universe and preserved as an effective means of explaining the toil and ills with which human existence is filled, by the manner of man's creation, his first disobedience, and his failure to attain immortality. It is this distinctly theological conception of Adam which becomes uppermost as the religious ideas of the Old Testament spread beyond the boundaries of Israel. The story of Adam becomes, with the growth of Christian theology, the most important source for the doctrine of the origin of sin, and over against him is put the second Adam—the first being the fountain of sin, the second the source of salvation. This conception is fully brought out in the teachings of Paul (see especially Rom. v. 12-21; 1 Cor. xv. 22 and 45-49). The perfection of Adam, the protoplast, in wisdom,

goodness, and power, is increasingly emphasized, but also the exceeding heinousness of his sin, involving all the race in its guilt and baneful consequences. Both find perhaps their fullest and most impressive expression in Milton's *Paradise Lost*. In Jewish theology the doctrinal development in general is arrested after the separation from Judaism of the new sect made up of the followers of Jesus. The predominant position henceforth occupied in Judaism by obedience to the Law brings about a concentration of Jewish thought on its various requirements. In place of doctrinal elaboration we have the homiletical interpretation of the narrative in Genesis, which leads to numerous additions in rabbinical literature to the biblical narrative of Adam and of the creation in general. These stories about Adam are collected in the so-called Midrash Rabba to Genesis, a German translation of which was published by Wünsche (*Der Midrasch Rabba zu Genesis*, 1882). (For further legends, telling of the repentance and death of Adam and Eve, see ADAM, BOOK OF.) From the Jews the stories made their way to the Arabs, and snatches of them are embodied in the Koran. Consult Sale's translation of the Koran and notes (London, 1877), especially to suras 15 and 17. The relations to Babylonian thought may be seen in Zimmern's edition of Schrader, *Die Keilschriften und das Alte Testament* (1902); Jeremias, *Das Alte Testament im Lichte des alten Orients* (1906).

ADAM. In Shakespeare's *As You Like It* (q.v.), an old servant who follows the fortunes of Orlando. His age, he apologetically says, "is as a lusty winter, frosty but kindly" (Act II, Scene 3). The part is one which Shakespeare himself is traditionally said to have played.

ADAM. A family of important Bavarian battle and animal painters.—ALBRECHT (1786-1872), the ancestor of the family, was born at Nordlingen and studied at Nuremburg and Munich. From 1809 to 1812 he resided at Milan as court painter to Eugene Beauharnais, Viceroy of Italy. In this capacity he took part in many of the Napoleonic wars, of which he painted many well-known pictures. His representations of the Russian campaign, not only in paintings, but also in an interesting series of 100 lithographic plates (1827-33), are graphic and interesting. After the downfall of Napoleon he was active in the service of Kings Maximilian I and Ludwig I of Bavaria, William of Württemberg, and the Emperor of Austria. In 1848 he took part in the Italian campaign, on the staff of General Radetzky. He was an excellent soldier, sharing in all the hardships of the service. His battle pieces are painted with objectivity and with the fidelity of a historian, but the color is hard and lacks harmony. They are chiefly in the possession of royal and imperial families of Bavaria, Württemberg, Austria, etc., and in the public collections of Germany.—His eldest son, BENNO (1812-92), is known chiefly as a painter of animals, both wild and domestic, and especially by his hunting pieces. Like the rest of his family, he resided in Munich, the gallery of which is rich in his works.—His younger brother, FRANZ (1815-86), assisted his father in all his later works and is especially known by his pictures of the Franco-Prussian War of 1870. The galleries of Berlin, Munich, Frankfort, and other cities are rich in his works, which excel in color those of all

other German battle painters of his day.—EUGEN (1817-80), the third son of Albrecht, likewise accompanied and assisted his father. His best independent works are the battles of the Italian campaign of 1859 and the Franco-Prussian War of 1870, in both of which he took part. He is also known as an illustrator.—EMIL (1843—), the eldest son of Benno Adam, was a pupil of his father and his uncle Franz, and is known especially as a painter of thoroughbred horses. His pictures are much prized by the titled sportsmen of England, France, Germany, and other countries. Consult the Autobiography of Albrecht Adam (Stuttgart, 1886), and for reproductions *Das Werk die Münchener Künstlerfamilie Adam*, with text by Holland (Nuremburg, 1890).

ADAM, a'dän', ADOLPHE CHARLES (1803-56). A French composer of operas. He was born and died in Paris. Though originally intended for a scientific career, he entered the conservatory in 1817 and studied composition under Boieldieu, mainly writing transcriptions for the piano. In 1829 his one-act opera, *Pierre et Catherine*, was produced with success, and 52 more followed, of which *Le chalet* and *Le postillon de Longjumeau* (1836) are the most famous. His chief merits are the characteristic French daintiness and finish. He was made professor of composition at the conservatory in 1849. His autobiography and souvenirs were published (Paris, 1860). Consult A. Pougin, *Adolphe Adam, sa vie, etc.* (Paris, 1876).

AD'AM, ALEXANDER. A Scotch classical scholar, born near Forres, in Morayshire. In 1757 he entered the University of Edinburgh. Later he held various posts as a teacher of the classics with great success. He published *Principles of Latin and English Grammar* (1772), *Roman Antiquities* (1791), *A Summary of Geography and History* (1794), and *A Compendious Dictionary of the Latin Tongue* (1805). His *Roman Antiquities* passed through many editions and was translated into German.

ADAM, BOOK OF. More or less extensive recensions of works dealing with Adam and Eve are extant. One of them is of Jewish origin, the other two are clearly Christian. Of the first, which was probably called *The Life of Adam and Eve*, we possess a Greek text published by Tischendorf in *Apocalypses Apocryphæ* (1866) under the misleading title "Apocalypses of Moses" because in the introduction the story is said to be recorded to Moses and later by Ceriani in his *Monumenta sacra et profana*, v (1868). An Armenian version of this work has been made known in an English translation by Conybeare in *Jewish Quarterly Review* (1895), and an Old Slavonic version has been published with a Latin translation by Jagić in *Denkschriften der Wiener Akademie der Wissenschaften* (1893). We also have a Latin *Vita Adæ et Evæ*, of which the best text is that published by Meyer in *Abhandlungen der Bayerischen Akademie der Wissenschaften* (1878). This work tells the story of the creation of Adam and Eve, their fall, penitence, restoration to divine favor, death, and burial. It seems to have been written originally in Hebrew or Aramaic and may come from the first century B.C. The original form is difficult to recover, and the present texts have here and there suffered in transmission, but there are very few Christian interpolations.

The Conflict of Adam and Eve is a Christian

work. It has been preserved in an Ethiopic version made from the Arabic. The Ethiopic text has been published by Trumpp in *Abhandlungen der Münchener Akademie der Wissenschaften* (1881). Translations were published by Dillmann, *Das Christliche Adamsbuch des Orients* (1853); Migne in *Dictionnaire des apocryphes* (1856); Malan, *Book of Adam and Eve* (1882). Of the Arabic text there is a manuscript at Munich. An earlier form of this work is *The Treasure Cave*, published by Sachau first in German, *Die Schatzhöhle* (1883), then in Syriac, 1888. The Arabic text was published by Mrs. Gibson in *Studia Sinaitica* (1901). Another Christian work is *The Testament of Adam* in Syriac, published with a French translation by Renan in *Journal Asiatique* (1853). Of this book Bezold published Arabic and Ethiopic versions in *Orientalische Studien Nöldeke gewidmet*, ii (1906, pp. 893 ff.). Renan proved that the original was written in Greek. See Fuchs, in Hennecke, *Neutestamentliche Apokryphen* (1904); Ginzburg in *Jewish Encyclopædia*, art. "Adam, Book of"; Schürer, *Geschichte des jüdischen Volkes* (1901, pp. 396 ff.).

ADAM, Sir FREDERICK (1781-1853). An English general. He was educated at Woolwich Military Academy and greatly distinguished himself in the Peninsular campaign. Although severely wounded at the battle of Alicante, he reentered the service upon his recovery. He repelled the last charge of the French guards at Waterloo.

ADAM, GRAEME MERCER (1839—). A Canadian author and editor. He was born at Loanhead, Midlothian, Scotland. After some experience with the Blackwoods, he emigrated to Toronto, where he became a partner in a successful publishing house. In 1876 he opened, in conjunction with John Lovell of Montreal, a branch house in New York. Returning to Toronto in 1878, he subsequently edited the *Canadian Bookseller*; founded, in conjunction with Goldwin Smith, the *Canadian Monthly* (1872); started the *Canadian Educational Monthly* (1879); and was for several years connected with the *Bystander* as assistant to Goldwin Smith, and contributed extensively to other periodicals. Coming again to New York (1892), he became identified with several publishing houses as "reader," wrote reviews, and compiled several books. In 1896 he removed to Chicago to become editor of *Self-Culture*. Among Adam's numerous separate publications are *The Canadian North-West* (1895); *Outline History of Canadian Literature* (1886); topographical and descriptive books of Canada, encyclopædias, and school books. In collaboration with Ethelwyn Wetherald, he wrote a successful historical romance entitled *An Algonquin Maiden* (1886). See MacMurchy's *Handbook of Canadian Literature* (1906); and Burpee, "Recent Canadian Fiction" in the *Forum*, August, 1899.

ADAM, JAMES (1860-1907). A Scotch classical scholar and educator, born in Aberdeenshire and educated at the University of Aberdeen and at Caius College, Cambridge. In 1885 and after, while classical lecturer at Emmanuel and Girton colleges, Cambridge, he was engaged in preparing an edition of Plato's *Apology* (published in 1887). Made classical tutor in Emmanuel College in 1890, Adam began work on his most important undertaking, an edition of Plato's *Republic*. In the same year that this was published (1902), the author was chosen to

deliver the Gifford Lectures at Aberdeen University. His subject, "The Religious Teachers of Greece," remained as the title of the lectures in book form, printed after his death. In 1903 he received the degree of Litt.D. from Cambridge University, where he was one of the most popular of lecturers during his service at Emmanuel College.

ADAM, JEAN (1710-65). A Scotch poet. She was born near Greenock. In her earlier life she was a teacher, but, compelled to give up her school, she became a street vendor. She lived a joyless life and died in the Glasgow poorhouse. She published a volume of religious poems in 1734. By some she is believed to be the author of *There's nae Luck about the House*, a beautiful lyric. (See MICKLE, WILLIAM JULIUS.) Consult *Ward's English Poets* (London, 1880).

ADAM, à'dän', JULIETTE (1836—). A Parisian writer making use of the pseudonyms Juliette Lamber and Comte Paul Vasili. She was born at Verberie, Oct. 4, 1836. One of her first books, *Le siège de Paris, journal d'une Parisienne* (1873), is an account of her experiences in 1870-71, when her husband was prefect of police. Her *Nouvelle Revue*, founded in 1879, and her salon have both been politically influential. She has written much for periodicals on politics, literature, education, and the position of women, as to which she agrees with George Sand and Madame d'Agoult. Her fiction, e.g., *Laide* (1876), *Grecque* (1877), *Païenne* (1883), is militantly hedonistic, a passionate protest against the anti-natural, or supernatural, in Christianity. She published volumes of reminiscences, as *Le roman de mon enfance et de ma jeunesse* (1902) and *Mes premières armes littéraires et politiques* (1904); also: *Mes sentiments et nos idées* (1905); *Mes illusions et nos souffrances durant le siège de Paris* (1906); *Mes angoisses et nos luttes* (1907); *Nos amitiés politiques avant l'abandon de la revanche* (1908); *Après l'abandon de la revanche* (1910); *Impressions françaises en Russie* (1912).

ADAM, ad'am, LAMBERT SIGISBERT (1700-59). The principal representative of a well-known family of French sculptors. He was born at Nancy, studied there with his father, a mediocre sculptor, and under unknown masters at Paris, and won the *Prix de Rome* in 1723. At Rome he received commissions from Cardinal de Polignac, whose antiques he restored, and from Pope Clement XII. He modeled his work after Bernini. In 1733 he returned to Paris. His works include the colossal figures of the Seine and the Marne upon the cascade of St. Cloud; two marble groups, "La Chasse" and "La Pêche" at Potsdam (Prussia); and the colossal fountain of Neptune at Versailles (1740), his masterpiece. In this work he was assisted by his brother, NICHOLAS SÉBASTIEN (1705-78), a pupil of his father and himself, whom he joined in Rome. His works are in Paris and at Nancy, the best being the tomb of Queen Catherine Opalinska in the latter city. Frederick the Great summoned him to Berlin as court sculptor, at the princely salary of 4000 livres, but, through the mistake of the Prussian servitor, he obtained instead the youngest and least important of the brothers, François Gaston (1710-61). During an activity of 13 years the latter adorned the gardens of Potsdam and Sans Souci with numerous sculptures. Consult Thirion, *Les Adams et Clodion* (1885); Lady Dilke,

French Architects and Sculptors of the Nineteenth Century (London, 1900).

ADAM, ä'dän', PAUL (1862—). A French author born in Paris. He participated in the Boulangist movement (1889), and was an unsuccessful candidate for a seat in the Chamber of Deputies. His earliest appearance in literature was made with *Chair molle* (1885), which shows the influence of the realist Zola. Five years later, however, the author signed the *Manifeste des cinq*, which favored a return to the idealistic novel; and thereupon began historical investigations and a study of contemporary French society. His novels dealing with present-day life are collected under the title *L'époque*, while those having an earlier time as background the author has grouped as *Le temps et la vie: histoire d'un idéal à travers les siècles*. His stories, chiefly in the manner of the symbolist school, include: *Robes rouges* (1891); *Le mystère des foules* (2 vols., 1895), and *La Bataille d'Uhde* (1897). He also published a cycle of four romances dealing with the period from 1792 to 1830: *La force* (1898; new ed., 1910); *L'enfant d'Austerlitz* (1902), *La ruse* (1903); *Au soleil de juillet* (1903). With J. Moréas he wrote *Le thé chez Miranda* (1887). He wrote the dramas *L'Automne* (1893, with G. Mowrey), and *Le cuivre* (1896). The tenth edition of *La ville inconnue* was printed in 1911. His problem novel *Stéphanie* (1913) upholds the "arranged" marriage.

ADAM, QUIRIN FRANÇOIS LUCIEN (1833–1900). A French magistrate and philologist. He was born at Nancy. Among his numerous works on philology, some of which deal with the languages of the native tribes of America and the dialects of Lorraine, the following are the most important: *Grammaire de la langue mandchoue* (1873); *Esquisse d'une grammaire comparée du Créé et du Chippéway* (2d ed., 1876); *Etudes sur six langues américaines* (1878); *Les patois lorrains* (1881); *Les idiomes négro-aryens et maléo-aryens* (1883). His *Langue mosquito*, a work on a language little studied at that time, won the Loubat prize in 1891.

ADAM, ROBERT. See FURNITURE.

AD'AM, TESTAMENT OF. See APOCRYPHA, *Old Testament*.

ADAM, WILLIAM (1751–1839). A British lawyer. He was born in Scotland and in 1774 entered Parliament, where he attached himself to the party of Lord North. Four years afterward he fought a duel with Fox (1778), in which Fox was wounded. He took an important part, however, in effecting the coalition between Fox and North and Shelburne and was one of the few to maintain his allegiance to his former adversary at the time of the French Revolution. He was one of the managers appointed by the Commons to conduct the impeachment of Warren Hastings (1788). He presided over the Civil Jury Court in Scotland from the time of its establishment (1816) until his death. Consult his *Life*, by G. L. Craik, in the *Dictionary of the Society for the Diffusion of Useful Knowledge*.

AD'AMANT (Gk. *ἀ*, *a*, priv. + *δαμᾶν*, *daman*, to tame). The name of any substance of extraordinary hardness. The name was applied to a supposed stone or mineral, the properties of which were long unknown. It was confounded by early writers with the lodestone or magnet. This confusion ceased with the seventeenth century, but the word for a long time had currency among scientific writers as a synonym for dia-

mond. The use of the term to denote the lodestone seems to have been due to the early Latin medical writers, who erroneously derived the word from the Latin *adamare*, 'to have an attraction for.'

AD'AMAN'TINE SPAR. See CORUNDUM.

ADAMAWA, ä'dä-mä'wä, or FUMBINA. A former native African state, mainly in what is now German Kamerun. It extended from about 9° to 4° N. lat. The name is generally applied to the region which lies between the Upper Benue and Logone rivers (Map: Africa, F 4). The country is elevated in its southern part, where some of the mountains reach an altitude of about 8000 feet. Its soil is very fertile, and climate, flora, and fauna are tropical. Politically, Adamawa is more or less autonomous and is ruled by a native sultan. The principal settlements are Yola, with a population estimated at from 12,000 to 20,000; Banjo, the centre of the ivory trade; and Nganudere. Cereals, vegetables, and cotton are grown, and there is considerable trade in ivory and rubber. Silk, sulphur, salt, and cloth are imported. The population is estimated to be over three million. The predominant part consists of Fulbe. (See FULAHS.) The first European to visit Adamawa was Dr. Barth in 1851. Consult Passarge, *Adamawa* (Berlin, 1895).

AD'AM BEDE. The title of a novel by George Eliot (see ELIOT, GEORGE), first published in 1859. The name is that of its principal character, a young English workingman of intellectual tastes and a keen conscience. He is the lover of Hetty Sorrel, but in the end marries Dinah Morris.

AD'AM CU'PID. A name applied to Cupid in Shakespeare's *Romeo and Juliet*, Act II, Scene 1. According to Upton there was an archer named Adam, whose skill was famous in Shakespeare's time, so that the significance of the epithet is evident. Upton cites in confirmation, *Much Ado About Nothing*, Act I, Scene 1: "And he that hits me let him be clapped on the shoulder and called Adam." Other critics maintain that the original was "Abram," a corruption from *Auburn*, since the early folios and quartos give "Abraham" in the passage.

ADAM DE LA HALLE, ä'dän' de lä ä'l' (c.1240–87). One of the early founders of the French drama. His *Play of Adam*, or *Le jeu de la feuille*, as it was also called, written for citizens of his native Arras for popular performance, is the earliest French comedy. Adam de la Halle was also a musician, and his *Robin et Marion* is the first European comic opera. His musical compositions, chiefly songs and motets, form a connecting link between the work of the French *déchanteurs* and the Flemish contrapuntists. His works are edited by Coussemaker (Paris, 1872). Consult: Ambros, *Geschichte der Musik*, vol. ii (Leipzig, 1892); H. Guy, *Essay sur la vie et les œuvres littéraires de Adam de la Halle* (Paris, 1898); E. Langlois, *Le jeu de Robin et de Marion* (Paris, 1896); F. Helfenbein, *Die Sprache des Trouvère Adam de la Halle aus Arras* (Strassburg, 1911).

ADAMI, ä-dä'me, FRIEDRICH WILHELM (1816–93). A German author, critic, and publicist. He was born at Suhl, studied medicine, then philosophy and history, in Berlin. He was a regular contributor to the *Kreuzzeitung*, translated, recast, and reviewed plays. Among his best original works are *Ein ehrlicher Mann* (1850) and *Der Doppelgänger* (1870). Among

the collections of his historical tales are *Fürsten- und Volksbilder aus der vaterländischen Geschichte* (1863) and *Aus den Tagen zweier Könige* (2 vols., 1866). His works are marked by a clear style and a thoroughly patriotic tone.

AD'AMI, JOHN GEORGE (1862—). An English pathologist. He was born at Manchester; was educated at Owens College, Manchester, and Christ's College, Cambridge, and studied also at Breslau and Paris. He became house physician to the Manchester Royal Infirmary, and demonstrator of pathology at Cambridge in 1887. In 1891 he was elected fellow of Jesus College, Cambridge, and in 1892 professor of pathology and bacteriology at McGill University in Montreal, Canada. He was also chosen advisory pathologist to the Montreal General and Royal Victoria hospitals, and in 1896 became Middleton Goldsmith lecturer to the New York Pathological Society. He was president of the Association of American Physicians in 1911-12. He published numerous papers on pathological topics, and articles on inflammation for Allbutt's *System of Medicine*. In addition, he wrote the following books: *The Principles of Pathology* (1908); *Inflammation: An Introduction to the Study of Pathology* (1910).

AD'AMITES. 1. An obscure and probably non-existent sect mentioned by Epiphanius (*Hær.* 52) as extant in the middle of the fourth century, and so called because they imitated Adamic simplicity in going without clothing while at worship. They are said to have practiced absolute continence. 2. A sect of fanatics founded by a certain Picard, which became numerous in Bohemia and Moravia in the fifteenth and sixteenth centuries, but had no connection with the Hussites. Picard styled himself Adam, the son of God, rejected the sacrament of the supper and the priesthood, and was charged with advocating the community of women. After his death his followers increased in Bohemia under several leaders. They even fortified themselves on an island in a tributary of the Moldau and committed various depredations. They were detested as much by the followers of Huss as by the Catholics. Ziska made war against them and slew great numbers, but they were never entirely rooted out. In fact, it is said that in 1849 a similar sect appeared in Austria.

AD'AMNAN, SAINT (625-704). An Irish abbot, properly Adam, of which Adamnan is a diminutive. He was born at Drumhome, southwest Donegal, the extreme northwest county, about the year 625, but entered the monastery of Iona. His father, Ronan, was the great-great-grandson of the uncle of St. Columba and also claimed kin with many Irish kings. The paternal grandfather was Tinne, from whom came the patronymic *Ua Tinne*, or 'grandson of Tinne,' an appellative which is occasionally found coupled with Adamnan's name. Ronnat, the mother of Adamnan, was descended from Enna, son of Niall, whose race, the Cincl Enna, possessed themselves of the tract lying between the channels of the Foyle and Swilly, which was called the Tir Enna, or 'Land of Enna,' and answers to the modern barony of Raphoe. In the year 697 he was elected abbot of Iona. His rule over that community was not, however, destined to be peaceful and fortunate. The Irish church then held the Oriental views about dates for observing Easter and the form of the tonsure. In his intercourse with the Saxon church, Adamnan had adopted the Roman or orthodox views, as

they are termed, and endeavored to put them in practice in his own community. He was thwarted in this object, and it is said that mortification at the failure caused his death. He died in Iona, Sept. 23, 704. He left behind him an account of the Holy Land, containing matters which he says were communicated by Arculfus, a French ecclesiastic who had lived in Jerusalem, which is valuable as the earliest information we possess of Palestine in the early ages of Christianity. But far more valuable is his *Vita Sancti Columbæ*, his life of St. Columba, the converter of the Piets and founder of Iona. Along with miracles and many other stories palpably incredible, this book reveals a great deal of distinct and minute matter concerning the remarkable body to which both the author and his hero belonged. The standard edition of the book is that of William Reeves, D.D., edited in 1857 for the Bannatyne Society of Edinburgh, and the Irish Archæological Society (Dublin, 1857), which, with an English translation, forms the sixth volume of *Historians of Scotland* (Edinburgh, 1874), reissued with additional notes by J. T. Fowler (Oxford, 1894). Nearly all the information to be had about the early Scoto-Irish church is comprised in that volume.

AD'AM OF BREMEN. A German historian. He was born, probably, at Meissen, Saxony (the date uncertain), and came to Bremen in 1067 from Magdeburg and became a canon of the cathedral and in 1068 principal of the cathedral school. He won perpetual fame by writing (between 1072 and 1076) from all available sources, including the oral testimony of Svend Estridson, King of Denmark, to see whom he made a special journey, a history of the Hamburg Church, which is one of the most precious of mediæval histories. The best edition of this great work, *Gesta Hammaburgensis Ecclesiæ Pontificum*, is by Lappenberg (Hanover, 1876). The third edition of the German translation, by J. C. M. Laurent, appeared in the series *Die Geschichtschreiber der Deutschen Vorzeit* (Berlin, 1893). As the appendix to the third and last book Adam gives a general account of the lands belonging to the Danes and Swedes and of Norway. In it occurs this interesting passage referring to America: "Besides this he [Svend Estridson, King of Denmark] told of still another island that had been found by many in that ocean [the Atlantic]. It is called Wine-land, because vines spring up there spontaneously, producing excellent wine. I mention this confidently, for I have learned from no fabulous rumor, but through definite information from Danes, that crops also grow there in abundance without having been sown." (Cap. 247, or § 38.) In his book Adam quotes from preceding chroniclers, from Cicero, from the Latin poets, Vergil, Horace, Lucan, Juvenal, and Persius; from the Latin Fathers, Jerome, Ambrose, Gregory the Great; from Bede, Cassiodorus, and Paulus Diaconus. But the style is defective and the Latin difficult and faulty, notwithstanding that he took Sallust as his master. Although the day of his death, October 12, is known from the church record of Bremen, the year is not, but probably it was about 1076.

ADAM OF ST. VICTOR (?-c.1192). A monastic poet of France. Nothing is known of him except that he died in the abbey of St. Victor in Paris. Yet he was "the most prominent and prolific of the Latin hymnists of the Middle

Ages." His works—complete as far as discovered, but doubtless far from being really so—were edited by Léon Gautier (3d ed., Paris, 1894; Eng. trans., London, 1881, 3 vols.). Consult: Julian, *Dictionary of Hymnology* (1888), French, *Sacred Latin Poetry* (1874), and Duffield, *Latin Hymns* (1888).

ADAMS. A town, including the villages of Renfrew, Maple Grove, and Zylonite, in Berkshire Co., Mass., 16 miles north of Pittsfield, on the Pittsfield and North Adams branch of the Boston and Albany Railroad and on the Hoosac River (Map: Massachusetts, A 2). Within the town limits is Greylock Mountain (3535 feet), the highest point in Massachusetts. The town has a public library, a statue of McKinley, a Quaker meeting-house, and churches of almost every denomination. Cotton and woolen goods, paper, foundry, and lime products are manufactured. Laid out and settled as "East Hoosuck" in 1749, Adams was incorporated under its present name (in honor of Samuel Adams) in 1778. It originally included both North and South Adams. The government is administered by town meeting. Pop., 1890, 9213; 1900, 11,134; 1910, 13,026; 1913 (est.), 13,500. Consult J. G. Holland, *History of Western Massachusetts* (Springfield, 1855).

ADAMS, ABIGAIL SMITH (1744–1818). The wife of John Adams, second President of the United States, and daughter of Rev. William Smith, minister of the Congregational Church at Weymouth, Mass. She was born at Weymouth, Mass., and died at Quincy, Mass. Through her mother, Elizabeth Quincy, she was descended from the Puritan preacher, Thomas Shepard of Cambridge, and though of defective education, delicate health, and nervous temperament, she was among the most influential women of her day, and one of its most vigorous of stylists, owing little to teaching but much to influence and environment. There are in her writings both originality and a remarkable idiomatic unconventionality, especially rare in the authors of her time. During and after the Revolutionary War she was at times separated from her husband, who was a delegate to Congress and who was afterward engaged in diplomatic business in Europe. Joining him in France in 1784, she accompanied him to London, where she had unpleasant social experiences. From 1789 to 1801 she lived at Washington, naturally enough, and then till her death at Braintree, in what is now Quincy. *The Familiar Letters of John Adams and his Wife*, published with a memoir by C. F. Adams (1876), show her to have been a woman of keenness, sagacity, and geniality and they throw very valuable light on the history and social life of her time.

ADAMS, ALVIN (1804–77). The founder of Adams Express Company of America. He was born at Andover, Vt., and in 1840 established between New York and Boston an express route which, subsequently extended, led in 1854 to the incorporation of the Adams Express Company. Consult Stimson, *History of the Express Business* (New York, 1881).

ADAMS, ANDY (1859—). An American author, born in Whitley Co., Ind., and educated in the public schools. After an early youth spent on a farm in Indiana, he removed to Texas, where for ten years he lived the life of a cowboy. During the excitement following the discovery of gold in Cripple Creek, Colo., he went to that State and engaged in mining. Shortly

afterward he began to write. His first book, *The Log of a Cowboy* (1903, 1912), showed a thorough knowledge of the conditions which he described and a considerable gift of vivid and graphic description. It was followed by *A Texas Matchmaker* (1904); *The Outlet* (1905); *Cattle Brands* (1906); *Reed Anthony, Cowman* (1907); *Wells Brothers* (1911).

ADAMS, BROOKS (1848—). An American lawyer and social essayist. He was born at Quincy, Mass., a son of Charles Francis Adams (q.v.). He was educated in Quincy, in Washington, and in Europe, according to the changes of his father's residence. He graduated at Harvard in 1870, was admitted to the bar, and practiced law till 1881. His writings include many magazine articles and the following books: *The Gold Standard; The Emancipation of Massachusetts* (1887), a study in the evolution of religious freedom; an historical essay, *The Law of Civilization and Decay*, and *America's Economic Supremacy* (1900); *The New Empire* (1902); *Railways as Public Agents* (1910); *Charles Francis Adams, an American Statesman* (1912); *The Theory of Social Revolutions* (1913); *Economics and Public Affairs* (1913).

ADAMS, CHARLES BAKER (1814–53). An American naturalist. He was born at Dorchester, Mass. He graduated at Amherst; assisted Prof. Edward Hitchcock in geological field-work; became tutor at Amherst, 1836; professor of chemistry and natural history in Middlebury College, Vt., 1838 to 1847, and was professor of astronomy and zoölogy at Amherst from 1847 till his death. From 1845 to 1847 he was State geologist of Vermont. He went several times to the West Indies in the interest of science; wrote on conchology, and with the assistance of Prof. Alonzo Gray, of Brooklyn, published an elementary work on geology.

ADAMS, CHARLES DARWIN (1856—). An American philologist and educator. He was born in Keene, N. H., and in 1877 graduated from Dartmouth College. After post-graduate studies at that institution he studied at the Andover Theological Seminary from 1879 to 1881. In the latter year he was appointed instructor in Greek at Cushing Academy. After remaining here until 1884, he became professor of Greek at Drury College. In 1893 he was appointed to the chair of Greek language and literature at Dartmouth College. In 1891 he studied at the University of Kiel, where he received the degree of Ph.D. In 1908 he became editor of *The Classical Journal*, and in 1906 and 1907 was president of the Classical Association of New England. He edited *Lysias, Selected Speeches* (1906).

ADAMS, CHARLES FOLLEN (1842—). A humorous dialect poet. He was born at Dorchester, Mass., and was educated in the common schools. He served in the Civil War and was wounded and captured at Gettysburg. In 1872 he began poetic production, cultivating the ballad in German dialect. His verses are collected under the titles *Leedle Yawcob Strauss and Other Poems* (1878) and *Dialect Ballads* (1887). His complete poems were collected and published together in 1910.

ADAMS, CHARLES FRANCIS (1807–86). An American diplomat and statesman, the son of President J. Q. Adams. He was born in Boston; spent the years 1809 to 1817 with his father in Europe, chiefly in Russia and England; prepared for college at the Boston Latin

School, and graduated at Harvard in 1825. He then spent several years in Washington and later studied law in the office of Daniel Webster (at Boston) from November, 1828, to January, 1829, when he was admitted to the bar, though he never practiced. During the next ten years he devoted himself chiefly to literary pursuits, contributing many papers to magazines, writing an able political pamphlet entitled *An Appeal from the New to the Old Whigs* (1835), and editing the *Letters of Abigail and John Adams* (1840-41). From 1841 to 1846 he was a member of the State Legislature, serving three years in the House and two in the Senate; and from 1846 to 1848 he was editor of the *Boston Whig*, and as such was the leader of that wing of his party called the "Conscience Whigs." In 1848 he presided over the Free Soil Convention at Buffalo, and was unanimously nominated for vice-president, but after the election retired to Quincy, Mass., and spent several years in editing the *Works of John Adams* (10 vols., 1850-56). In 1858 he was elected to Congress as a Republican and served with marked ability until May, 1861, when he was sent as United States Minister to England. Here he remained for seven years and during the Civil War rendered invaluable services to his government. In face of the pronounced sympathy for the South manifested by the aristocracy and the upper social classes generally and of the favoritism at times of the British government itself, he preserved throughout a dignified demeanor and performed his duties with such ability as to earn for himself a place second only to that of Franklin in the history of American diplomacy. Indeed, many years later Lowell said: "None of our generals in the field, not Grant himself, did us better or more trying service than he in his forlorn outpost in London." He returned to America in 1868 and was elected to the presidency of Harvard in the following year, but declined to serve. In 1872 he barely failed of a nomination to the presidency at the hands of the Liberal Republicans. He was the arbitrator for the United States at Geneva in 1871 and 1872 (see ALABAMA CLAIMS) and to him is due in great part the credit for the successful settlement of all difficulties with England growing out of the controversy of the Civil War. On his return he was engaged for several years in editing the *Memoirs of John Quincy Adams* (12 vols., 1874-77). Both in politics and diplomacy Mr. Adams was austere, dignified, eminently sincere, and independent to a fault. As an authoritative biography consult C. F. Adams, Jr., *Life of Charles Francis Adams* (Boston, 1900), in the American Statesmen Series.

ADAMS, CHARLES FRANCIS (1835-1915). An American soldier, publicist, and historian. He is a son of Charles Francis Adams and was born in Boston, Mass., May 27, 1835. He graduated at Harvard in 1856, studied law in the office of Richard Henry Dana, Jr., and was admitted to the bar in 1858. He entered the Union Army as first lieutenant in a Massachusetts cavalry regiment in 1861, became a captain in 1862, served as chief of squadron at Gettysburg, and at the close of the war was in command, as colonel, of a regiment of colored cavalry. In March, 1865, he was brevetted brigadier-general of volunteers, and in August retired from active service. From 1884 to 1890 he was president of the Union Pacific Railroad Company. From 1893 to 1895 he was chairman of the Massachu-

setts Park Commission and as such took a prominent part in planning the present park system of the State. After the year 1874, he devoted much of his time to the study of American history and in recognition of his work in this field was chosen president of the Massachusetts Historical Society in 1895 and of the American Historical Association in 1901. In 1913 he lectured at Oxford University on American History. His writings and addresses both on problems of railway management and on historical subjects are marked by a singular clarity of statement and a degree of intellectual independence that has frequently given rise to widespread controversy. His works include: *Railroads, Their Origin and Problems* (New York, 1878); *Notes on Railway Accidents* (New York, 1879); *Richard Henry Dana: A Biography* (Boston, 1891); *Three Episodes of Massachusetts History* (Boston, 1892), a work which gives an account of the settlement of Boston Bay, of the Antinomian controversy, and of church and town government in early Massachusetts; *Massachusetts: Its Historians and Its History* (Boston, 1893); an excellent *Life of Charles Francis Adams* (Boston, 1900), in the American Statesmen Series, and *Lee at Appomattox, and Other Papers* (New York, 1902). With his brother, Henry Adams, he wrote *Chapters of Erie, and Other Essays* (Boston, 1871).

ADAMS, CHARLES KENDALL, LL.D., J.U.D. (1835-1902). An American educator and historian, born in Derby, Vt. He graduated at the University of Michigan in 1861, where he was assistant professor of Latin and history from 1863 to 1867 and full professor of history from 1867 to 1885. Having studied abroad in 1867 and 1868, he established (1869-70) an historical seminary which proved of great value in promoting the study of history and political science. In 1881 he was made non-resident professor of history and Latin at Cornell and in 1885 succeeded Andrew D. White as president of that university. From 1892 until 1902 he was president of the University of Wisconsin. In 1890 he was president of the American Historical Association. From 1892 to 1895 he was editor-in-chief of Johnson's *Universal Cyclopædia* (now the *Universal Cyclopædia*). Among his publications are *Democracy and Monarchy in France* (1872); *British Orations* (1884); *Higher Education in Germany, a Manual of Historical Literature* (1889); *Christopher Columbus, his Life and Work* (1892); a *History of the United States*, with W. P. Trent (rev. ed., 1913).

ADAMS, CHARLES R. (1848-1900). An American dramatic tenor. He was born at Charlestown, Mass. He studied in Vienna and sang for three years at the Royal Opera, Berlin, and for nine years at the Imperial Opera, Vienna. His reputation, especially as a Wagnerian singer, was earned chiefly abroad. In 1879 he took up his residence in Boston, where he was highly esteemed as a teacher.

ADAMS, EDWIN (1834-77). An American actor. He was born in Massachusetts and first appeared at the Boston National Theatre, Aug. 29, 1853, as Stephen in *The Hunchback*. He played Hamlet with Kate Bateman and J. W. Wallack at the New York Winter Garden in 1860 and then starred in all the principal cities; reappeared in New York in 1866, as Robert Landry in *The Dead Heart*; was in the company when Booth's Theatre opened, Feb. 3, 1867, and played Mercutio, Iago, and Enoch Arden in that

house. It was in the latter character that he attracted the most attention.

ADAMS, EPHRAIM DOUGLASS (1865—). An American educator, born in Decorah, Iowa, and graduated from the University of Michigan in 1887. He took a post-graduate course also at his alma mater, receiving the degree of Ph.D. in 1890. In the same year he was appointed special agent in charge of street railways for the eleventh census. His earlier work as teacher was done at the University of Kansas, where he became assistant professor (1891) and associate professor (1894) of history and sociology and in 1899 professor of European history. He was made associate professor of history in Leland Stanford Junior University in 1902 and, four years later, full professor. His published writings include *The Control of the Purse of the United States Government* (1894); *The Influence of Grenville on Pitt's Foreign Policy* (1904); *British Interests and Activities in Texas* (Albert Shaw Lectures, Johns Hopkins University, 1910).

ADAMS, FRANK DAWSON (1859—). A Canadian geologist, born in Montreal. He was educated in McGill, Yale, and Heidelberg universities and became a member of the Geological Survey of Canada in 1880. Having been appointed lecturer in geology in McGill University in 1889, five years later he became dean of the faculty of applied science and Logan professor of geology. His publications include *Iron Ore Deposits of Bilboa* (1901); *The Monterey Hills* (1903); *On a New Nepheline Rock* (1904); *An Investigation into the Elastic Constants of Rocks* (1906); *Geology of the Haliburton and Bancroft Areas* (1910).

ADAMS, FRANKLIN PIERCE (1881—). An American writer of humorous prose and verse, born in Chicago and educated at the Armour Institute and the University of Michigan. After two years (1903-04) of newspaper work on the *Chicago Journal*, he went to New York to become a member of the staff of the *Evening Mail*. For this paper he began to write, daily, a column of miscellany of a kind sufficiently defined by its caption, "Always in Good Humor." "F. P. A.'s" "Diary of our own Samuel Pepys" is a clever parody of the famous Englishman; while his verses, especially those in which he imitates certain odes of Horace, show considerable skill and felicity of expression. At the beginning of 1914 he went over to the *New York Tribune*. His writings in book form include *Tobogganing on Parnassus* (1911); *In Other Words* (1912).

ADAMS, FREDERICK UPHAM (1859—). An American author and inventor. He was born in Boston, but removed to Elgin, Ill., and was educated in the schools of that city. He practiced the profession of mechanical engineering from 1882 to 1890, during which period he invented (1886) an electric lamp-post which became the standard throughout the United States, and (1887) a form of electric light tower. From 1894 to 1897 he was chief smoke inspector for Chicago. Adams constructed, in 1900, an experimental passenger train for the Baltimore and Ohio Railroad which broke the speed records made up to that time. An active interest in social problems induced him to found a periodical called *The New Time*, which he edited from 1896 to 1898. He wrote several works on engineering and social topics as well as a number of novels. These publications include: *Atmos-*

pheric Resistance and its Relation to the Speed of Railway Trains (1893); *President John Smith* (1896); *The Kidnapped Millionaires* (1901); *John Burt* (1903); *How Cities are Governed in Great Britain* (1904); *John Henry Smith* (1905); *The Bottom of the Well* (1905); *The Revolt* (1907); *The Vegetarians*, a comedy, and *Ramley*, a drama (1911).

ADAMS, GEORGE BURTON (1851—). An American historian, born at Fairfield, Vt., and educated at Beloit College (class of 1873), at the Yale Divinity School, and at the University of Leipzig. He became professor of history at Yale in 1888; was president of the American Historical Association (1907-08), and member of the board of editors of the *American Historical Review* (1895—). His original works include: *Primer of Mediæval Civilization* (1883); *Civilization during the Middle Ages* (1894); *The Growth of the French Nation* (1896); *European History* (1899); vol. ii. in Hunt and Poole's *Political History of England* (1905); *The Origin of the English Constitution* (1912).

ADAMS, HANNAH (1755-1832). One of the earliest American women writers. She was the author of *Views of Religious Opinions* (1784), *History of New England* (1799), *Evidences of Christianity* (1801), and a *History of the Jews* (1812), all of which brought fame but little money. Her home was in Brookline, Mass.

ADAMS, HENRY (1838—). An American historian, third son of Charles Francis Adams (q.v.). He was born in Boston and graduated at Harvard in 1858. He was private secretary to his father when the latter was Minister to England, assistant professor of history at Harvard from 1870 to 1877, and editor of the *North American Review* in 1875 and 1876. One of the fruits of his original methods of instruction was a volume of *Essays on Anglo-Saxon Law* (1876), of which he wrote the first, on *Anglo-Saxon Courts of Law*. The others were by H. C. Lodge, E. Young, and J. L. McLaughlin. He subsequently made his home in Washington and devoted himself to a study of the administrations of Jefferson and Madison, the results of which appeared in nine volumes as a *History of the United States from 1801 to 1817* (1889-90; new ed., 1909), a work of original research. He previously edited the writings of Albert Gallatin (3 vols., 1879) and wrote a life of John Randolph (1882; 2d ed., 1898) for the American Statesmen Series. He is also the author of a volume of *Historical Essays* (1891), and of a *Life of George Cabot Lodge* (1911).

ADAMS, HENRY CARTER (1851—). An American economist. He was born in Davenport, Iowa, and was educated at Iowa College and Johns Hopkins University. He was statistician to the Interstate Commerce Commission from 1887 to 1911; special agent of the eleventh census, in charge of the department of transportation; and after holding several less important educational positions he became (1887) professor of political economy and finance at the University of Michigan. In 1913 he accepted a position as adviser to a Chinese commission appointed to standardize railway records. His publications, besides reports, include: *Taxation in the United States, 1789-1816* (1884); *Public Debts* (1887); *Relation of the States to Industrial Action* (1887); *Relation of American Municipalities to Quasi-Public Works* (with others, 1888); *Economics and Jurisprudence* (1897); *The Science of Finance; an Investigation of Public Expen-*

ditures and Public Revenues (1898); *Regulation of Railway Rates* (with H. T. Newcomb, 1906).

ADAMS, HENRY CULLEN (1850–1906). Congressman from Wisconsin, 1903–06, and author of the Adams Act of 1906, under which the state experiment stations receive \$720,000 per annum for original research in agriculture. Most of his life was spent in Wisconsin, where he engaged in dairying and fruit-growing and filled numerous state offices, notably that of Dairy and Food Commissioner from 1895 to 1902. His interest in agricultural matters continued in Congress, and he took a prominent part in the passage of the food and drug act of 1906 and the meat inspection legislation of that year. His efforts to aid the experiment stations by an enlarged federal appropriation began in 1903, and despite feeble health he was indefatigable in support of his bill until its passage in 1906 without a dissenting vote. The Adams Act is among the most important ever passed in encouragement of American agriculture, and its author is regarded as one of its principal benefactors.

ADAMS, HERBERT (1856—). A prominent contemporary American sculptor. He was born Jan. 28, 1856, at West Concord, Vt., and was educated in the public schools of Fitchburg, Mass., and in the Institute of Technology at Worcester. He studied art in the Normal Art School of Boston, but principally with Mercier in Paris, where he remained five years. On his return to the United States he was instructor in the art school of Pratt Institute, Brooklyn; he was elected to the National Academy of Design in 1899 and became vice-president in 1906. Important exhibitions of his works were held at the Chicago World's Fair in 1893 and the St. Louis Exposition in 1903, in both of which he received highest awards. He is a member of the National Institute of Arts and Letters. Adams is especially known among American sculptors for his beautiful busts of women. Perhaps the best of such productions is the exquisite bust of Miss Pond, his future wife, carved at Paris in 1887. Other examples are "Primavera," the tinted busts of "St. Agnes," of "A Young Lady" in pink marble (Metropolitan Museum, New York), of "The Rabbi's Daughter," and the marble bust of Miss Julia Marlowe. The same qualities of refinement and grace are seen in his other works, such as the "Angel" in the Emmanuel Baptist Church, Brooklyn; the Hoyt Memorial (1895) in the Judson Memorial Church, New York, and the more solemn Welch Memorial in the Auburn Theological Seminary. His contribution to the Vanderbilt memorial entrance of St. Bartholomew's, New York, consists in two bronze doors and a beautiful marble tympanum of the "Madonna with Angels" (1902), reminiscent of early Florentine sculpture. For the Congressional Library, Washington, he modeled two bronze doors and a statue of Professor Channing. His other works include the bronze Jonathan Edwards Memorial in a church at Northampton, Mass.; bronze statues of Richard Smith, the typefounder, in Philadelphia, of William Ellery Channing in Boston, and William Cullen Bryant (1911) in New York. Of all American sculptors, Adams stands nearest to the Early Renaissance in his fresh and refined realism and in his technical skill in marble cutting, yet he is none the less modern and original. Consult Taft,

History of American Sculpture (New York, 1904).

ADAMS, HERBERT BAXTER (1850–1901). An American educator and historian. He was born at Amherst, Mass., and educated at Amherst College. He took his doctor's degree at Heidelberg and then became connected with Johns Hopkins University on its inception in 1876. He was made associate professor of history in 1883 and professor in 1891. Owing to ill health, he resigned in 1901. He edited the valuable *Johns Hopkins Studies in History and Political Science* from the beginning, and an important series of monographs on American educational history published by the United States Bureau of Education. Besides many monographs, he wrote *The Life and Writings of Jared Sparks* (2 vols., 1893). Dr. Adams's influence upon historical studies in America, especially through the numerous pupils whom he trained, was very beneficial. He took great interest in university extension and in the work of the American Historical Association, of which he was secretary from its founding in 1884 until 1900, when he resigned and was made its first vice-president.

ADAMS, JOHN (1735–1826). The second President of the United States. He was born at Quincy, Mass., Oct. 30, 1735, of a family descended from Henry Adams, a Puritan emigrant who settled in Massachusetts about 1640. He graduated from Harvard in 1755 and, after an interval of teaching, studied law and was admitted to the bar in 1758. In 1764 he married Abigail Smith, daughter of the minister at Weymouth, a woman who herself became conspicuous, and whose influence and assistance were important factors throughout the entire career of her husband. (See ADAMS, ABIGAIL.) Soon after he went into politics and, although not a resident of Boston, was selected to act as counsel with Gridley and Otis in presenting to the Governor a memorial against the Stamp Act (q.v.). Adams then took the bold stand that the act was void because Parliament had no right to tax the colonists, and that such statutes could have no possible force over persons who had not consented to the passage thereof. In 1768 he moved to Boston, and soon after was offered and declined the position of advocate-general in the Court of Admiralty, an office which would have greatly increased his professional opportunities, though it would have placed him under embarrassing obligations to the Royalist politicians. Two years afterward he was able, without prejudicing himself among the patriot party, to render the unique service of defending Captain Preston in the Boston Massacre case and securing his acquittal. He had already written on taxation for the *Boston Gazette*, and he again published articles at the time of the controversy over the independence of the judiciary, collaborated in the authorship of the reply to Hutchinson in 1773, and later produced the "Novanglus" articles in reply to the Tory, Leonard. He was closely associated with Samuel Adams in the political leadership of Massachusetts, especially in the legislative crisis of June, 1774, and then was chosen by the House of Representatives as one of their five delegates to the Continental Congress. In that body his energy was devoted to the adoption of a comprehensive program having three distinct elements—the organization of commonwealth governments on an independent basis, the formation of a national confederate government, and the establishment of diplomatic

relations with foreign powers. The first victory was gained when the Congress passed the resolutions of May 10 and 15, 1776, recommending to all colonies the formation of State governments on a basis such as to serve them if permanently independent. This made natural, if not inevitable, the formal Declaration of Independence (q.v.), the original motion for which was seconded by Adams, who now was placed on the committee which drafted that document.

While a member of the Second Continental Congress it was Adams who, on June 14, 1775, suggested that George Washington be selected to command the continental forces. And for three years he worked arduously in perfecting the details of the new national government, serving on numberless committees, and being placed at the head of several important ones at a time when the congressional committees were the heads of the undeveloped executive departments. Especially in the War Department, and to a considerable extent in the Navy Department, was his influence great and his work attended with quite permanent results, while his membership of the Committee on Foreign Relations enabled him to become equipped for the service by which later he attained distinction. In 1778 he was sent to France to supersede Silas Deane; but his stay was brief, the treaty between that country and the United States having been concluded just before his departure from Boston. During his attendance upon the Continental Congress he continued to be an active counselor of the leaders in Massachusetts, although he declined the office of Chief Justice of the State. He was an active member of the committee of three which drafted the first constitution of Massachusetts. To that work he came almost directly from his first mission to France, and from it he proceeded at once to undertake his further duties of securing from Holland support for the national finances and of negotiating, with the other commissioners, terms of peace with England.

His success in effecting a loan in Holland was preceded by several months of difficult diplomacy, the result of which was that in April, 1782, the Dutch government formally recognized Adams as the minister of an independent nation. Stimulated by this notable accomplishment and by the realization that upon his exertions depended the New Englanders' rights in the Newfoundland fisheries, Adams entered upon the negotiations at Paris with a spirit of independence and of determination which, although seeming to occasion rather than to allay embarrassments, contributed much to the successful issue.

The post of minister to Great Britain was next occupied by Adams, but the relations between the countries were still such as to make the life irksome to one of Adams's temperament, especially as his desire to be recalled was strengthened by his belief that the service he was rendering was bringing no particular benefit to his country. Accordingly, in the spring of 1788, he returned, having already shown in detail his views on American affairs in his elaborate *Defense of the Constitution of the United States* (3 vols., London, 1787). He was elected Vice President at the first election under the new constitution and served for two terms, exercising, in the formative years of political parties and in the time of nearly equal division of the Senate between them, a power seldom possessed by a vice president. Where matters

of foreign policy raised the questions at issue, Adams sympathized with England and thus was thrown into opposition to the friends of France, led by Jefferson. In matters of internal policy, also, he supported the program of Hamilton, and where party lines were finally drawn he was recognized as one of the leaders of the Federalists. By them he was advanced to the presidency at the same time that, under the system then prevailing, the leader of the opposing party became Vice President. Jefferson's success in 1800 was made possible, however, largely by the developments of Federalist policy and of factional controversy within the party. Upon Adams's accession to office, relations with France had been complicated by the Directory's refusal to receive Pinckney, and when finally the joint mission of Pinckney, Marshall, and Gerry met with highly questionable treatment, the prospect seemed dubious. (See X Y Z CORRESPONDENCE.) War seemed imminent, and indeed there were hostile encounters on the water. Preparations for the struggle were coupled with the effort to repress the violent opposition to the policy of the administration through the harsh means of the Alien and Sedition Acts (q.v.). While Adams's attitude toward France was the most criticised act of his administration, yet he himself felt that it was his best public service, as is evidenced by the epitaph he wished placed over his body: "Here lies John Adams, who took upon himself the responsibility of peace with France in the year 1800."

War having been averted, it was at once recognized that the Federalists in these statutes had gone too far in restraining the rights of the individual and in encroaching upon the jurisdiction of the States. Certain it was that in his thoroughness Adams had given his opponents a very welcome and a very powerful means of attack, of which they promptly and vigorously took advantage, and at once began, by such steps as the Virginia and Kentucky resolutions (q.v.), the campaign which finally established the party of the opposite doctrine. This establishment was made easy also by the internal weakening of the Federalist party in the bitter fight for leadership between Adams and Hamilton. The retirement of Adams thus occurred amid the hostility of his enemies and the hatred of those who were his party associates. Nor was it possible to expect any relief from the painfulness of such a situation when the defeated one possessed a manner and a temperament such as were Adams's. Consequently, aside from intermittent criticism and counter criticism, and aside from service in the Massachusetts Constitutional Convention of 1820, this retirement continued unbroken. He died July 4, 1826, on the same day as Jefferson. President John Quincy Adams was his son.

Consult: His *Works*, with a biography, edited by C. F. Adams, 10 vols. (Boston, 1850-56); also his biography, J. T. Morse (Boston, 1885); *The Letters of Abigail and John Adams* (Boston, 1840-41), and *Familiar Letters of John Adams to his Wife during the Revolution; With a Memoir of Mrs. Adams*, edited by C. F. Adams (New York, 1876), and Chamberlain, *John Adams* (1898).

ADAMS, JOHN (1760-1829). The assumed name of Alexander Smith, one of the mutineers of the English ship *Bounty*. With eight sailors and some men and women from Tahiti he landed on Pitcairn Island and formed a government, of

which he was the head. In 1800 he was the only surviving Englishman. He established worship and such a school as was possible. In 1808 Captain Folger, an American, landed there and brought the world the first news of this strange settlement. Adams had not heard a word from civilized countries for twenty years. England never sought to punish him, and he died in peace, leaving a prosperous and religious people. See PITCAIRN ISLAND.

ADAMS, JOHN (1772–1863). An American teacher. He was born in Connecticut, graduated at Yale in 1795 and, after teaching for fifteen years in secondary schools in New Jersey and his native State, became principal of Phillips Academy, Andover, Mass. That place he filled for 23 years, resigning in 1833. Besides having built up one of the historic schools of New England, Dr. Adams is remembered as the schoolmaster of Oliver Wendell Holmes and the subject of the lines:

“Uneasy lie the heads of all that rule—
His most of all whose kingdom is a school.”

He wrote numerous pamphlets on education. Consult M. E. B. and H. G. B., *The Story of John Adams, a New England Schoolmaster* (1900).

ADAMS, JOHN COUCH (1819–92). An English astronomer and mathematician. He was born near Launceston, in Cornwall, and early manifested an aptitude for mathematics. After the usual amount of school training he was sent to St. John's College, Cambridge, where he attained the honor of senior wrangler and became a mathematical tutor. In 1843 he attempted to ascertain by mathematical calculation whether certain observed irregularities in the motion of Uranus could be explained on the hypothesis of perturbation (q.v.) exercised by an exterior planet. The problem at issue was the inverse of the usual perturbation problem. Instead of computing the effect brought about by a planet of known mass pursuing a known orbit, it was required to determine the unknown cause of a known effect. By 1845 Adams had solved this new problem and was able to assign to the hypothetical planet, the now well-known Neptune, a position differing less than two degrees from its actual place in the sky. But a careful telescopic search was at the time postponed or neglected, so that the honor of the great discovery completing Adams's mathematical researches by an observational verification was lost to Great Britain. Leverrier, of Paris, had been making an independent investigation, and by Aug. 31, 1846, he too had determined Neptune's place in the sky. He wrote to Galle at Berlin, and the latter found the planet on September 23d of the same year. This mathematical discovery of Neptune is justly counted among the greatest triumphs of science. To commemorate it, the Adams Prize, which is awarded biennially for the best essay on some subject in pure mathematics, astronomy, or other branch of natural philosophy, was founded at the University of Cambridge in 1848. In 1858 Adams became professor of mathematics at St. Andrews, but was recalled to Cambridge before the end of the year to assume the Lowndean chair of astronomy, which he held until his death. In 1861 he succeeded Challis as director of the University observatory. He was awarded the Copley Medal of the Royal Society in 1848. His collected papers were published in two vol-

umes at Cambridge under the editorship of his brother, Prof. William Grylls Adams, and R. A. Sampson, the first volume appearing in 1896, the second in 1901.

ADAMS, JOHN QUINCY (1767–1848). The sixth President of the United States and son of the second President, John Adams. He was born in Quincy, Mass., July 11, 1767. In 1778 he was taken abroad by his father when the latter visited Paris on a diplomatic mission, and only three years later, after studying for brief periods at Paris, Leyden, and Amsterdam, the youth was appointed private secretary to Francis Dana, the American Minister to Russia. As Dana was not received by the Russian government, Adams rejoined his father in Paris and served in a secretarial capacity to the American commissioners who were negotiating the treaty of peace with England. At the conclusion of that important work the elder Adams was rewarded with the English mission; the younger Adams returned home and entered Harvard College, graduating in 1787.

Upon his graduation he began the study of law with Theophilus Parsons (q.v.) and was admitted to the bar in 1790. He contributed to the political literature of the time, discussing the theories of Tom Paine, and especially the Genet incident (see GENET, E. C.), and our relations with France. His unusual opportunities and training were readily recognized, and in 1794 Washington sent him as Minister to The Hague. Later he was appointed to the Portuguese mission, but before he had entered upon the duties of that office his father had become President, and the son, upon the recommendation of Washington himself, was transferred to the more responsible post of Minister to Prussia. His father recalled him in 1801, in order that his successor in the presidency might be under no embarrassment. In the year following his return Adams was sent to the State Senate, and in 1803 the Massachusetts Legislature sent him to the United States Senate in preference to Timothy Pickering (q.v.).

While in the Senate he gave his support to the purchase of Louisiana (q.v.), although he disagreed with the administration upon some of the ensuing problems, and also approved the policy of the embargo and the non-importation acts. The support of these measures so unpopular in New England caused him to be hated by the Federalists there and finally cost him his seat in the Senate. His successor was chosen several months before the usual time of filling the vacancy and Adams at once resigned. He was, however, so identified with the party in power that in 1809 President Madison appointed him Minister to Russia. While there he was named as one of the commissioners who were to act in connection with the mediation proposed by Russia, but which was made impossible by the declination of England. He was soon appointed, however, one of the five negotiators who concluded the Treaty of Ghent (q.v.) at the close of the War of 1812.

From that work Adams proceeded to London, where he served as Minister to England until his varied and remarkable diplomatic career was ended in 1817 by his appointment by President Monroe to the post of Secretary of State. His work as Secretary was concerned with the difficult negotiations which in 1819 ended in the purchase of Florida, the more delicate relations with England with reference to the fisheries

convention of 1818 and the conflicting claims in the Columbia River basin, and the more far-reaching steps taken to counteract the encroachments of the Holy Alliance, in connection with which was announced the Monroe Doctrine (q.v.), so that some credited the latter to Adams. As a member of the cabinet, aside from matters of diplomacy, he took a unique position in upholding General Jackson for his conduct in the Florida War, and in rendering a highly valuable service to his later antagonist.

By virtue of his position, the friends of Adams expected that in 1824 he would be advanced in the same manner as Madison and Monroe, who had each in turn passed from the State department to the presidency. The nominations, however, were still made by the congressional caucus, which at this time was controlled by Crawford. Moreover, the newly formed trans-Alleghany States were pressing their claims for recognition, so that the revolt against the old nominating system and the crystallizing of the various factions within the one great party alone remaining active led to the candidacy of four Republicans in 1824. Of these Jackson received 99 electoral votes, Adams 84, Crawford 41, and Clay 37. When the vote, according to the Constitution, was thus given to the House of Representatives, choosing from among the three highest, the Clay interests joined with those of Adams and effected the defeat of Jackson. Adams, upon his accession, made Clay his Secretary of State, and not only brought upon himself charges of corruption, but also secured the vigorous enmity of the rapidly increasing Jackson wing of the Republican party. To offset this, Adams was not qualified to exert the influence usually attaching to a political leader, nor was he able so to make use of his office as to build up an Adams faction that could hope to wage a successful warfare with the embittered Jacksonians. It was natural, therefore, that after four troublous and not particularly profitable years, Adams should be overwhelmed in the election of 1828. Instead of going into retirement, he adopted the unprecedented course of returning to Washington as a member of the House of Representatives, and in that capacity rendered still further and conspicuous service to the nation from 1831 until his death. Being practically above party restraints, he was free to do a work which made notable the later years of "the old man eloquent." The slavery issue appeared in Congress in two forms, involving the question of the right of the government or of its officials to exclude abolitionist literature from the mails, and involving the question whether petitioners to the House of Representatives might demand that their petitions should be read, even if not considered. The former problem provoked a long and severe dispute, while the second controversy was made acute by the introduction of the "Gag Rules" (q.v.), which, Adams contended, substantially destroyed the right of petition, and against which he labored vigorously and in the end successfully. Late in 1846 he was stricken with paralysis, and early in 1848 he was again stricken, while in his seat in the House, and died two days later, on Feb. 23, 1848.

Adams followed the example of his father in keeping an extensive diary, which is included in his *Memoirs*, edited by C. F. Adams (12 vols., Philadelphia, 1874-77). For his biography consult W. H. Seward, *Life of Adams*

(Auburn, 1849), and Quincy, *Memoir* (Boston, 1858); or, for the most recent work, Morse, *John Quincy Adams* (Boston, 1882 and 1899).

ADAMS, JOHN QUINCY, 2D (1833-94). An American politician. He was born in Boston, the grandson of President J. Q. Adams and son of Charles Francis Adams. He graduated at Harvard, 1853, and became a lawyer. He served three terms in the Massachusetts Legislature, and was an unsuccessful candidate for governor on the Democratic ticket in 1867 and 1871. In 1872 he was nominated for the vice-presidency on the ticket with Charles O'Connor by those Democrats who would not support Horace Greeley. He became a member of the Harvard Corporation in 1877. Two years before his death he declined a seat in President Cleveland's cabinet.

ADAMS, JULIUS WALKER (1812-99). An American civil engineer. He was born at Boston, Mass., studied for two years at the United States Military Academy, and from 1833 to 1869 was connected as engineer with various railways and public works. From 1869 to 1878 he was chief engineer of the Brooklyn board of city works, and from 1878 to 1889 consulting engineer of the board of public works of New York City. A suggestion of his led to the formation of a company which eventually had charge of building the first bridge over the East River at New York. During the Civil War he for a time commanded the First Long Island Volunteers and during the New York draft riots of 1863 commanded the troops at Printing House Square.

ADAMS, MAUDE KISKADDEN (1872-). A popular American actress. She was born at Salt Lake City, Nov. 11, 1872, the daughter of James and Annie Adams, both actors. She first appeared on the stage in the West, in children's parts, when very young. At 16 she joined E. H. Sothorn's company in New York, and played in *The Midnight Bell*. Afterward she was a member of Charles Frohman's stock company. With John Drew in *The Masked Ball* (1892) she made an extraordinary advance in public favor. She became a star as Lady Babbie in *The Little Minister*, produced in New York (1898), where in 1899 she played Juliet to the Romeo of William Faversham. In 1900 and 1901 she won another popular success as the Duc de Reichstadt in Rostand's *L'Aiglon*, and the next season she played Miss Phoebe in Barrie's *Quality Street*. She played in Mrs. Burnett's *The Pretty Sister of José* (1905), and in 1906 was successful in Barrie's *Peter Pan*. She has taken the Shakespearean parts of Viola in *Twelfth Night*, June, 1908, and of Rosalind in *As You Like It*, June, 1910. During the year 1909-10 she also appeared in *What Every Woman Knows*, and in 1911 she took the title rôle in a translation of Rostand's *Chantecler*. In 1913-14 she starred in Barrie's *The Legend of Leonora*. Consult Clapp and Edgett, *Players of the Present*, in Dunlap Society Publications (New York, 1899).

ADAMS, NEHEMIAH (1806-78). An American Congregational clergyman. He was born in Salem, Mass., graduated at Harvard in 1826, and three years later at Andover Theological Seminary. He then became pastor in Cambridge, Mass., and from 1834 was pastor of the Essex Street Church, Boston. After a winter spent in Georgia for his health, he published *A South Side View of Slavery* (1854). His praise of the effect of slavery on the religious character of the

negroes provoked much hostile criticism. He published several controversial works and a *Life of John Eliot*.

ADAMS, OSCAR FAY (1855—). An American editor and author. He was born at Worcester, Mass., was educated in secondary schools, taught classes in English literature and, beginning in 1880, wrote much for periodicals. He edited *Through the Year with the Poets* (12 vols., 1886), and published *The Story of Jane Austen's Life* (1891; 2d ed., 1897); *The Archbishop's Unguarded Moment, and Other Stories* (1899); *A Brief Handbook of English Authors* (1884; 7th ed., 1893); *Dear Old Story Tellers* (1889; new ed., 1911); *A Dictionary of American Authors* (1897; 5th ed., 1905); *Sicut Patribus and Other Verse* (1906); *A Motley Jest—Shakespearean Diversions* (1909).

ADAMS, PARSON ABRAHAM. A leading character in Fielding's novel, *Joseph Andrews*. He is a country curate, a very learned scholar, skilled in dead and living languages but excessively simple-minded and unfamiliar with the ways of the world. In spite of his poverty, his generosity and native dignity command respect; his oddities, however, and his absence of mind bring him into many quaint adventures.

ADAMS, SAMUEL (1722–1803). One of the leading men in the promotion of the American Revolution. He was born in Boston, Mass., Sept. 27, 1722, of an aristocratic family and, like John Adams, the second President of the United States, was descended from Henry Adams, a Puritan emigrant. He fitted for college at the Boston Latin School and entered Harvard in 1736. On leaving college in 1740, he entered a law office; but the law proving distasteful, he next entered a counting-house, and soon became a merchant himself, but failed. Subsequently he became a partner with his father in a brewery and failed after the latter's death. As a business man, he seems throughout to have been a complete failure; and the burden thus thrown on the other members of the family was increased later by the complete absorption with which he devoted his time and energy exclusively to political affairs and public service. When a candidate for the degree of A.M. at Harvard College, he had maintained in his thesis the affirmative of the question: Whether it be lawful to resist the supreme magistrate, if the commonwealth cannot be otherwise preserved.

He was early engaged in the activities of town politics in Boston; and the overthrow of the Land Bank, with the incidental destruction of his father's estate, brought him into contact with provincial affairs and decisively influenced his general attitude toward the home government. His formal entry into politics was in his election as a tax collector of Boston in 1763, an office which he held for two years. His careless, or at all events unsuccessful, performance of the duties of that office soon afforded his opponents the basis for a vigorous though ineffectual attack, but both his personal integrity and political uprightness remained above suspicion. By him were drafted the important instructions given by the town of Boston to its representatives in the assembly in 1764, and in these was put forth one of the earliest protests against the ministerial plan of Colonial taxation.

Likewise in 1765 Adams drafted the Boston instructions to representatives, and in the same year he himself was sent to the Legislature, and remained a member until 1774. Being

elected clerk of the House in 1766, and also serving on many committees, it was natural that he should be the author of many of the most important state documents of the pre-revolutionary period. Instructions to the political agent in London, addresses to the Governor, appeals to the ministry, and proposals or exhortations addressed to fellow colonists, in great number issued from the Massachusetts House of Representatives, and in many instances from the pen of Adams. Thus the very influential circular letter of February, 1768, as well as the *True Sentiments of America*, issued in the same year; and the widely read *Appeal to the World* of 1769, have been traced to the authorship of Adams. Later, in 1772, he prepared for the town of Boston the very telling pamphlet on *The Rights of the Colonists as Men, as Christians, and as Subjects*. Very important as were all these contributions to the movement toward revolution, the most effective literary work of Adams was, undoubtedly, the great number of newspaper articles, under various pseudonyms, in the patriotic *Boston Gazette*. In these he made plain the cause of the colonists, exposed the impracticability of any reconciliation, converted the hesitating and inspired the Radicals, and exerted a very far-reaching influence in preparing the popular mind for revolution and in hastening the approach of the crisis. In practical politics as well, he was recognized as a leader not only in Massachusetts but in the other colonies. He bore the burden of the long series of controversies with the governors of Massachusetts over the presence of troops, the salaries of judges, and the place of meeting of the Legislature and, at the time of the Boston Massacre of March, 1770, headed the committee which demanded from Hutchinson the immediate withdrawal of the troops. He was conspicuous in planning the local "committees of correspondence"; and when finally, in June, 1774, the Massachusetts Legislature bade defiance to Gage and issued the call for the Continental Congress, it was Adams who directed the movement.

He was naturally sent to the Continental Congress (1774–81), and when that body finally declared for independence, it may be said that the real life work of Adams had been completed. He had been the ideal representative of the town-meeting system, the extreme defender of the "natural" rights of man, and the irrepresible advocate of independence. His work during the Revolution was less noteworthy and was at times open to criticism. Thus, he was one of the strongest supporters of the committee system of national administration, and one of those who delayed unnecessarily and unfortunately the organization of executive departments under single heads. In the politics of his native State he always took an active and effective interest. He was one of the committee which prepared the present constitution of the State, the only constitution of the Revolutionary period still in force. He served on the Executive Council of the State, was for several years Lieutenant-Governor (1789–94), and three times was elected Governor (1794–97). He was considered an opponent of the Federal Constitution in 1788, but on his finally giving his voice in favor of adoption, with the proposal of amendments, its ratification was assured. He died in Boston, Oct. 2, 1803. For his biography, consult: W. V. Wells (3 vols., Boston, 1865); J. K. Hosmer (Boston, 1885); H. A. Cushing (ed.), *The Writ-*

ings of Samuel Adams (4 vols., New York, 1904-08).

ADAMS, SAMUEL HOPKINS (1871—). An American author, born at Dunkirk, N. Y. Having graduated from Hamilton College in 1891, he spent the next nine years as reporter and special writer on the *New York Sun*. He was managing editor of McClure's syndicate in 1900-01; advertising manager of McClure, Phillips & Co., 1901-02, and a member of the staff of *McClure's Magazine*, 1903-05. Becoming interested in the evils of some phases of the patent medicine business, he contributed to *Collier's Weekly* in 1906 and later, a remarkable series of articles on quack medicines. The exposures which he made resulted in the correction of many of the abuses described, even driving several manufacturers of patent medicines out of business. Adams wrote also *The Mystery* (with Stewart Edward White, q.v., 1905); *The Flying Death* (1906); *Average Jones* (1911); *The Secret of Lonesome Cove* (1912); *The Health Master* (1913).

ADAMS, SARAH FULLER FLOWER (1805-48). An English poet. She was born at Great Harlow, Essex, and married William Bridges Adams in 1834. Her longest work is *Vivia Perpetua, A Dramatic Poem* (1841), having as its subject the early life of the Christians. It is a fine lyrical drama. Vivia's monologue on forswearing Jupiter is especially impressive. Mrs. Adams was the author of several beautiful hymns, among which are "Nearer, my God, to Thee" and "He sendeth sun, He sendeth shower." She was a Unitarian.

ADAMS, SUZANNE (1873—). An American lyric soprano. She was born in Cambridge, Mass., Nov. 28, 1873. She studied with Marchesi in Paris, and made her debut at the Paris Opera in 1894 as Juliette in Gounod's *Roméo et Juliette*. She remained at the Opera three years, then went to Nice. In the summer of 1898 she appeared at Covent Garden, London, and during the season of 1898-99 at the Metropolitan Opera House, New York. In 1898 she was married to Leo Stern, the violoncellist, who died in 1904. Her rôles include Juliette, Marguerite, Gilda, Queen in *Les Huguenots*, Queen of the Night in the *Magic Flute*, Mimi, and Micaela. Her voice is of beautiful quality and great compass, but is rather slender.

ADAMS, THOMAS (1612-55). An English preacher, called by Southey "the prose Shakespeare of Puritan theologians . . . scarcely inferior to Fuller in wit or to Taylor in fancy." He was minister at Willington, Wingrave, and London, and "observant chaplain" to Sir Henry Montague, the Lord Chief Justice. Adams was a Puritan within the Church of England, as distinguished from the nonconformist Puritans who left the church. He published a large number of sermons, the quaint titles of two of which are *Heaven and Earth Reconciled* and *The Devil's Banquet*. It is likely that John Bunyan read and was influenced by these writings. They have been republished in Nichol's *Puritan Divines* (3 vols., 1862).

ADAMS, THOMAS SEWALL (1873—). An American economist and educator, born in Baltimore, Md. He received a bachelor's degree from the Baltimore City College in 1893, and the degree of Ph.D. from Johns Hopkins University in 1899. After a year as clerk in the census office at Washington, he resigned (1900) to become assistant to the Treasurer of Porto Rico.

He was made associate professor of political economy in the University of Wisconsin in 1901 and full professor in 1908. The chair of political economy in Washington University was offered him in 1910, and he accepted it, resuming his former position at the University of Wisconsin, however, the next year. In 1911 he was tax commissioner of Wisconsin. His published writings include: *Taxation in Maryland* (1900); *Labor Problems* (with H. L. Sumner, 1905); *Mortgage Taxation in Wisconsin and Neighboring States* (1907); *Outlines of Economics* (with R. T. Ely, 1908).

ADAMS, WALTER SYDNEY (1876—). An American astronomer, born in Antioch, Turkey. After graduating from Dartmouth College in 1898 he did advanced work at the University of Chicago and in Munich. In 1901 he was appointed assistant in the Yerkes Observatory. In 1904 he was made assistant astronomer, and in 1909 astronomer, at the Mt. Wilson Solar Observatory. For two years (1910-11) he was acting director of the observatory. Adams became a member of several astronomical societies. He wrote numerous papers on solar and stellar spectroscopy and on the rotation of the sun. Among his more important published works is *Investigation of the Rotation Period of the Sun by Spectroscopic Methods* (1911).

ADAMS, WILLIAM (c.1575-c.1620). The first Englishman in Japan, whose romantic story is closely connected with the opening of that Empire. He was born in Kent, near the mouth of the Thames. Having entered the service of some Dutch merchants, he sailed, in 1598, for the East, from the Texel, as the chief pilot of a fleet of five small ships. After a severe voyage the *Charity*, in which Adams was sailing, anchored off the coast of Bungo (Kiushiu). Iyéyasu had recently come to power, and Adams, after a brief imprisonment, was taken into his favor and employed in the government service, to its great advantage. He built vessels and gave helpful information in respect to the intrigues of the Spanish and Portuguese. At a later day he received the revenues of the village Hemi, near Yokosuka, the modern imperial dockyard in Yeddo Bay. In 1613 the *Clove*, an English ship, brought other Englishmen to Firando, and, with Adams, they proceeded to establish a factory, of which Richard Cocks was chief. In 1616 Iyéyasu died, and foreigners soon fell into disfavor. Not being allowed to return to his wife and children in England, Adams married a Japanese wife, and their descendants are still living. He died May 16, 1620. A street in Yeddo was named after him, and a celebration is still held in his honor. Letters of Adams may be found in *Purchas his Pilgrimes* and in the publications of the Hakluyt Society. Consult: *The Diary of Richard Cocks, 1615-22* (London, 1883); Hildreth, *Japan as It Was and Is* (Boston, 1855); and Diósy, "In Memory of Will Adams," in *Transactions and Proceedings of the Japan Society*, vol. vi, pp. 325-353 (London, 1905).

ADAMS, WILLIAM (1814-48). An English allegorist. He was educated at Eton and at Merton College, Oxford, where he became tutor and fellow in 1837. Appointed vicar of St. Peter's-in-the-East, Oxford, in 1840, he resigned because of his ill health, and passed the last four years of his life at Bonchurch, Isle of Wight. Adams was the author of several popular religious allegories, most of which were written during the years when he was slowly dying.

They comprise *Silvio*, *The Shadow of the Cross*, *Fall of Cræsus*, *The Old Man's Home*, and the *King's Messengers*. They are all of interest, and *The Old Man's Home* is likely long to survive, because of its natural grace and charm. Adams is also the author of a boy's story entitled *Cherry Stones*, reprints of which are still frequent.

ADAMS, WILLIAM (1807-80). An American Presbyterian clergyman. He was born at Colchester, Conn., graduated at Yale in 1827, and at Andover Theological Seminary in 1830. He became pastor of the Congregational Church, Brighton, Mass., in 1831, and of the Broome Street Presbyterian Church in New York City in 1834 (out of which the Madison Square Presbyterian Church was formed in 1853), and there he ministered till in 1873 he became president of Union Theological Seminary (New York) and professor of sacred rhetoric. He died at Orange Mountain, N. J., Aug. 31, 1880. He was moderator of the New School Presbyterian General Assembly in 1852. He published several volumes of discourses.

ADAMS, WILLIAM DAVENPORT (1851-1904). An English journalist and author, the son of W. H. Davenport Adams. He was educated at Edinburgh University and began newspaper work in 1870. He became literary editor of the *London Globe* in 1885 and was also well known as a dramatic critic. He published *Famous Books; Sketches in the Highways and Byways of English Literature* (1879); *Byways in Bookland* (1888), and edited a *Dictionary of English Literature* (1877) and a *Dictionary of the Drama* (1899).

ADAMS, WILLIAM GRYLLES (1836-1915). An English physicist. He was born at Lanest, Cornwall, and was educated at Cambridge University, where he was made a fellow of St. John's College. In 1863 he was appointed professor of natural philosophy and astronomy in King's College, London, where he carried on many investigations in addition to giving instruction, until his retirement in 1906. Professor Adams served as vice-president and president of the Physical Society of London, as president of the Society of Electrical Engineers, as president of the mathematical and physical section of the British Association, and is a member of the Royal Society. He devised a new form of polariscope which could be used to measure the optical axes of crystals. Among his more important investigations which have been published are those on *Simultaneous Magnetic Disturbances*, *Action of Light on Selenium*, *Alternate Current Machines*, and the *Testing of Dynamo Machines*.

ADAMS, WILLIAM TAYLOR (1822-97). An American educator and writer of juvenile fiction, popularly known as "Oliver Optic." He was born at Medway, Mass. For 20 years he taught in Boston public schools; for 14 years he was a member of the Dorchester School Committee; and he was once elected to the Legislature. His first book, *Hatchie, the Guardian Slave* (1853), was followed by more than 100 volumes of juvenile fiction, contributed in large part to *Oliver Optic's Magazine*, of which he was the editor. These stories appeared in series, of which the most popular were *The Boat Club*, *Young America Abroad*, *The Starry Flag*, *Onward and Upward*, and *The Yacht Club*. He published also two novels, *The Way of the World* and *Living Too Fast*. His books of the *Young America Abroad* series had a lasting in-

fluence in creating and perpetuating a system of education at sea and under naval discipline.

ADAM'S APPLE (Lat. *Pomum Adami*). The projection seen on the front of the neck nearly midway between the summit of the breastbone and the chin. It is particularly visible in males, but rarely noticeable in females and then only at a late period of life. Its name originated from the superstition that a portion of the apple given to our first parent stuck in his throat and that the enlargement thus caused has been transmitted to the race. It is produced by the convergence of the two quadrilateral plates of the thyroid cartilage of the larynx. See LARYNX.

ADAM'S BRIDGE. A chain of islands extending across the Gulf of Manar, between Ceylon and the peninsula of Hindustan (Map: India, C 7). It is cut by several channels through which small boats can pass.

AD'AMSON, PATRICK (1537-92). A famous Scotch prelate and writer, originally known as Conston, Constant, Consteane, or Constantine. He was born at Perth. He studied law at the University of St. Andrews and in 1566 went to France as a tutor, where he underwent six months' imprisonment for referring to the son of Mary, Queen of Scots, as King of France and England, in a Latin poem he wrote on the occasion of the prince's birth. He narrowly escaped death during the Paris massacre, and, obliged to live in concealment for seven months, he employed his time in writing Latin poetical versions of the Book of Job and of the tragedy of Herod. In 1573 he returned to Scotland, took orders, and became minister at Paisley. In 1576 he received the appointment of Archbishop of St. Andrews from his patron, the Earl of Morton, Regent of Scotland, and entered into frequent polemics with the Presbyterians concerning episcopacy. In 1588 he was excommunicated on various charges and died in great poverty and affliction at St. Andrews, Feb. 19, 1592. Consult: P. Adamson, *Poemata Sacra* (London, 1619); Baillie, *The Recantation of Patrick Adamson* (Glasgow, 1646).

ADAMSON, ROBERT (1852-1902). An English educator and philosophical writer. He was at one time professor of logic and mental philosophy at Owens College (Victoria University) and in 1895 was appointed professor of logic and rhetoric at the University of Glasgow. He is regarded as an important representative of the so-called Neo-Hegelian movement in English philosophy. Among his writings are *The Philosophy of Science in the Middle Ages* (1876); *On the Philosophy of Kant* (1879); the article on Kant in the *Encyclopædia Britannica*, and *Fichte* (1881). Following his death various volumes were published from the lecture notes of his students, edited by W. R. Sorley: *The Development of Modern Philosophy, and Other Essays* (2 vols., with memorial introduction, 1903); *The Development of Greek Philosophy* (1906); *A Short History of Logic* (1911).

ADAM'S PEAK (native, *Samanhela*). A mountain in the south of Ceylon, 7350 feet high, terminating in a narrow platform, in the middle of which is a hollow 5 feet long, having a rude resemblance to a human footprint (Map: India, D 7). Mohammedan tradition makes this the scene of Adam's penance, after his expulsion from Paradise; he stood 1000 years on one foot, and hence the mark. To the Buddhists the impression is the *sripada*, or sacred footmark, left by Buddha on his departure from Ceylon; while

the Hindus claim it as the footprint of their god Śiva. Over the sacred spot stands a wooden canopy, and multitudes of devotees, Buddhist, Hindu, and Mohammedan, frequent it.

ADANA, ä'dä'nä. The capital of the Turkish vilayet of Adana (15,400 square miles; pop., 422,400) (Map: Turkey in Asia, F 4). It is situated in the southeast of Asia Minor on the Seihan River (ancient Sarus), about 42 miles northeast of the seaport of Mersina, with which it is connected by rail. Its position near the passes of the Taurus gives it strategical importance. The river is deep, and in 1912 plans were consummated to irrigate 1,200,000 acres in the plain. Adana is the seat of considerable trade in emery, cotton, wool, grain, and wood. Iron is found in the vilayet in the vicinity of Adana, and the output is 40,000 tons a year. The town has a large steam spinning-mill. The population is about 49,000, including a large number of Armenians and Greeks. There was a massacre of Christians here in 1909. Adana was an important place in the time of the Romans. After a period of decline its prosperity revived under the Caliph Harun-el-Rashid.

ADANS LE ROI. See ADENEZ.

ADANSON, ä'dän'sôn', MICHEL (1727-1806). A French naturalist and physicist. He was born at Aix, in Provence. He studied the natural and physical sciences under Réaumur and Jussieu in Paris and journeyed to Senegal in 1749, where, during a period of five years, he engaged in researches in botany, electro-physics, and meteorology, and made collections of plants and animals. He was one of the first to recognize the electrical nature of the lightning stroke, and he demonstrated also the similarity of the shock from the electric eel (*Gymnotus electricus*) to the discharge from the Leyden jar. He was also one of the earliest to describe the mode of transportation and deposit of beach sands along oceanic coasts. On his return to Paris from Senegal he was elected a member of the Academy of Sciences. His most important work, however, was in botany, and he published many important monographs on various groups of plants and devised several schemes of classification, none of which latter has, however, received any considerable amount of recognition. Among his more important works are *Histoire naturelle du Sénégal* (Paris, 1857; German ed., Leipzig, 1773); *Familles des plantes* (2 vols., Paris, 1763); *Histoire de la botanique et plan des familles naturelles des plantes*, a posthumous work edited by his son, A. Adanson, and by Payer (2 vols., Paris, 1864). For further particulars concerning his life and works, consult Cuvier, *Eloge historique* (Paris, 1819).

AD'ANSO'NIA. A genus of about four species belonging to the family Malvaceæ and named by Linnæus in honor of the botanist Adanson (q.v.). The best-known species, *Adansonia digitata*, the baobab, also called the monkey-bread tree, is a native of tropical Africa and the East Indies. It is one of the largest known trees—not, indeed, rising to a very great height, but exceeding most other trees in the thickness of its trunk (20 to 30 feet). Even its branches (60 to 70 feet long) are often as thick as the trunks of large trees, and they form a hemispherical head 120 to 150 feet in diameter, their outermost boughs drooping to the ground. The leaves are 5 to 7-parted; the flowers are white and extremely large, on drooping peduncles of a yard in length. The

fruit, monkey-bread, is of the size of citron. The bruised leaves (Lalo) are mixed with the food of the inhabitants of tropical Africa, and Europeans in that country employ them as a remedy for diarrhœa, fevers, and diseases of the urinary organs. The pulp of the fruit, which is slightly acid and pleasant to the taste, is eaten with or without sugar; and the expressed juice mixed with sugar is much esteemed as a beverage, being very refreshing, effectual in quenching thirst, and regarded as a specific in putrid and pestilential fevers. The bark is said to be powerfully febrifugal. The other species occur in East Africa, Madagascar, and Australia.

ADAPA, ä'dä-pä. The hero of a Babylonian myth known to us through a tablet from the reign of Amenhotep IV (c.1377-1361 B.C.) found at Tel el-Amarna (q.v.) and three tablets from the library of Assurbanipal (668-625 B.C.) in Nineveh. Adapa, whose name may perhaps also be read Adama (see ADAM), is the son of Ea, endowed by his father with wisdom but not with immortality. His home is at Eridu, once situated on the Persian Gulf. Fishing in the sea, his boat is overturned one day by the south wind. He is called to account for this by Anu (q.v.). But his father, Ea, warns him, when he shall appear before Anu, not to eat the food of death or drink the water of death set before him and tells how by mourning apparel he is to secure the sympathy of Tammuz and Gishzida. In heaven, however, food of life and water of life are finally placed before him. That had not been expected by Ea, and the son, following his advice, lost immortality. Adapa is distinctly said to be a human being (*Zir ameluti*, 'offspring of men'); this phrase likewise shows that he is not the first man. Yet he is also called "the son of Ea." He is the priest and representative of this god in Eridu and possibly identical with one of the antediluvial kings. These lived for thousands of years, but finally had to die. The point of the myth is the failure to attain immortality, though almost within grasp. This it has in common with the story of Adam in Genesis. It is of great interest to observe that such Babylonian myths found their way to Egypt as early as in the fourteenth century B.C. In the Tel el-Amarna copy the divisions of words are marked by small dots in red ink, showing that it was intended for use in teaching the Babylonian language in Egypt. This renders it probable that the myth was also known in Palestine at that time. See Jensen in *Keilinschriftliche Bibliothek*, vi. 1 (1900); Zimmern, in Gunkel's *Schöpfung und Chaos* (1895); *Keilinschriften und das Alte Testament* (1902); Rogers, *Cuneiform Parallels to the Old Testament* (1912).

AD'APTA'TION (Lat. *ad*, to + *aptare*, to fit). In plants, the adjustment of an organ or an organism to its environment or surroundings, as shown in its structural form; e.g., a thick-skinned leaf is an adaptation to a dry environment. The state of a perfectly adapted plant is sometimes called "epharmony," but this condition is rarely found, and the adaptations of most plants may be regarded as more or less imperfect. See ECOLOGY; NATURAL SELECTION.

A'DAR. The twelfth month of the ecclesiastical, and the sixth month of the civil, Jewish year, coinciding with February-March of the common year. The 7th of Adar became a fast for the death of Moses; the 9th another on

account of the dissension of Hillel and Sham-mai; but more important is the 13th, which is called the fast of Esther, in memory of the fasting of Mordecai, Esther, and the Jews, whose destruction was threatened by Haman (Esther iv. 15-16). The fast is followed by the feast of Purim, celebrated on the 14th and 15th, in commemoration of the escape of the Jews of Persia from the fate designed for them by Haman, the cruel counselor of Ahasuerus. See ESTHER.

ADDA, äd'dä (Lat. *Adua*). A tributary of the Po (q.v.), rising in the Rætian Alps, on the northern borders of Italy above Bormio (Map: Italy, D 2). After traversing the Valtellina, it flows, or rather expands, into the Lake of Como. Below Lecco it traverses the plain of Lombardy in a direction south-southeast, passing Lodi, and falls into the Po about 8 miles above Cremona. Total length, about 180 miles; navigable for 75 miles.

AD'DAMS, JANE (1860—). A social settlement worker. She was born at Cedarville, Ill., Sept. 6, 1860. She graduated at Rockford Female Seminary in 1880, and the following year, when the seminary became a college, received the degree of A.B. After two years of study in Europe, and a year at the Women's Medical College at Philadelphia, she decided to devote her life to social work among the city poor. Together with Miss Ellen G. Starr, she established (in 1889, at Chicago) the Hull House, the leading social settlement in the United States, of which she became the head worker and guiding spirit. Miss Addams has less sympathy with theoretical studies of the social problem than with every-day experience with all sorts and conditions of people. Her practical common sense, great executive ability, and fine unselfish spirit have made her the natural leader of the settlement movement in this country. She has taken an active interest in city administrative problems and served for three years as inspector of streets and alleys in the district around Hull House. She took a prominent part in the formation of the National Progressive Party in 1912. She has been a frequent contributor to current periodical literature on the nature of the social settlements, their relation to the labor movement and to philanthropy, and various other topics, and published *Democracy and Social Ethics* (1902), *The Spirit of Youth and the City Streets* (1909), *Twenty Years at Hull House* (1910), *A New Conscience and an Ancient Evil* (1912). See HULL HOUSE; SOCIAL SETTLEMENTS.

AD'DAX, or **AD'DAS** (Lat., of African origin). A hippotragine antelope (*Addax nasomaculatus*) of northeastern African deserts, related to the oryx. It is about 3 feet in height at the shoulders, robust in form, nearly white in color, tinged with reddish brown forward, and having a white blaze upon the nose, and black hoofs, large and rounded for treading upon the desert sands. It has long ears, a long, tufted tail, shaggy forehead and throat, and both sexes have high, spirally twisted horns, alluded to by Pliny when he described the antelope under the name strepsiceros. Its habits are similar to those of the oryx, and it is hunted by the Arabs with greyhounds. Consult A. E. Pease, *Proceedings Zoölogical Society of London* (1896, p. 810), who says that it is called by the French of Algeria "antilope du sud," by the Arabs, "begra el Oouash" or "meha," and

by the Tuaregs, "tameeta." See plate of LARGE ANTELOPES, in vol. i.

AD'DER (an adder by mistake for a nadder, AS. *næddre*, Goth. *nadro*, Ger. *Natter*, a snake). A common name applied both to certain poisonous snakes, mostly of the family Viperidæ, and to certain harmless snakes of the family Colubridæ. In the former case it is practically a synonym of viper (q.v.). Several venomous serpents are known as puff-adders and death-adders, under which names they will be found described and illustrated elsewhere. Various harmless snakes of the genus *Tropidonotus* are known as adders both in Europe and America, as well as the American copperhead (q.v.), the water adder (see MOCCASIN SNAKE), and the spreading or blowing adder (see HOGNOSE), which, under provocation, assumes somewhat the appearance of a viper. Specifically, in English literature, the word usually means the common viper (*Vipera berus*) of Europe, the only venomous snake of Great Britain.

AD'DICKS, JOHN EDWARD (1841—). An American capitalist and politician, born in Philadelphia. Through the construction of gas plants and the financing of gas companies he acquired a considerable fortune, which he vastly increased through the organization of the Bay State Gas Company of Boston in 1884, and the purchase in 1892 of a controlling interest in the Brooklyn Gas Company. In his later years he gave himself up largely to the pursuit of political ambitions and established himself in the State of Delaware with the belief that it would be possible to win a United States senatorship from that State. In 1895 he entered upon a campaign for the senatorship which has scarcely been paralleled in persistence, factional bitterness, and charges of political corruption, in the whole history of senatorial elections. In the election of 1895 Addicks was able to prevent the election of his rival, H. A. Dupont, although unable to win the election himself. In 1898, in consequence of the schism between the Addicks and Dupont factions in the Republican party, then the majority party, the Legislature was deadlocked and the senatorship remained vacant. Again, in 1901, with two senatorships vacant, the Addicks candidacy deadlocked the Legislature and left the State unrepresented in the United States Senate. In 1903 Addicks procured the election to the Senate of one of his followers, J. Frank Allee, with the understanding, according to common report and intimations from Addicks himself, that Allee would later resign, in order that the Governor, another supporter of Addicks, might appoint the latter for the unexpired senatorial term. Allee, however, refused to recognize the supposed obligation to resign, and in 1905 Addicks again entered upon a campaign for election by the Legislature. After a long deadlock Addicks was defeated in 1906 by Dupont.

The great fortune of Addicks was seriously impaired by the expenses, legitimate and illegitimate, of his long senatorial campaign. It suffered further impairment by a court order in 1907 which compelled Addicks to pay over to the receiver of the Bay State Gas Company, bankrupted largely through Addicks's mismanagement, \$890,000 of profits unlawfully drawn from the concern.

ADDING MACHINES. See CALCULATING MACHINES.

AD'DINGTON, HENRY, first VISCOUNT SID-

MOUTH (1757-1844). An English Tory statesman. He was born at Reading. He graduated at Brasenose, Oxford, in 1778, studied law, and was admitted to the bar in 1784. Persuaded by his college mate and friend, the younger Pitt, he entered Parliament in 1783. Subsequently he filled the positions of Speaker of the House of Commons, 1789-1801, and Premier and Chancellor of the Exchequer, 1801-04. Owing to the opposition to his war policy, he resigned in 1804, but the King raised him to the peerage as first Viscount Sidmouth and made him President of the Council (1805). He was Lord Privy Seal in 1806, and again President of the Council in 1806 and 1807. He was Home Secretary from 1812 to 1822, and member of the cabinet from 1822 to 1824. Addington was an extreme reactionary. As Home Secretary he approved heartily of the Manchester massacre (1819). He was also the author of four of the infamous "six acts" (q.v.), and the instigator of the state trials for sedition and blasphemy that made his government ridiculous. He died at Richmond Park, Feb. 15, 1844. Consult G. Pellet, *Life and Correspondence of the Right Hon. H. Addington, first Viscount Sidmouth* (London, 1847).

AD'DIS, WILLIAM E. (1844—). An English clergyman. He was born at Edinburgh and was educated at Merchiston Castle School, Glasgow College, and Balliol College, Oxford. He became a Roman Catholic in 1866 but returned to the Church of England in 1901. He was parish priest of Sydenham from 1878 to 1888, an assistant clergyman at Melbourne from 1888 to 1892, and minister of the High Pavement Chapel (Unitarian), Nottingham, from 1893 to 1898. In 1898 he became professor of Old Testament criticism in Manchester College, Oxford. He was appointed curate of St. Martin and All Saints, Oxford, in 1909, and in the following year he became vicar of All Saints, Ennismore Gardens, London. He is the author of the following works: *Catholic Dictionary*, written in conjunction with Thomas Arnold (new ed., 1903); *Documents of the Hexateuch* (new ed., 1906); *Christianity and the Roman Empire*; *Hebrew Religion to the Establishment of Judaism under Ezra* (1906).

ADDIS ABEBA, äd'dès ä-bä'bä. The capital of Abyssinia, situated in the province of Shoa, in about lat. 9° N. and long. 39° E. (Map: Africa, H 4). It occupies an extensive area and is picturesquely situated at an altitude of nearly 10,000 feet. In its general appearance it resembles more a camp than a capital city. The town is absolutely without any streets and is intersected in several parts by deep ravines. The royal palace is situated on an eminence and consists of a number of buildings of cheap and flimsy architecture surrounded by several walls. It is the seat of the only Abyssinian school in the country. Of recent years there have been several projects undertaken to better the railway and telegraph facilities of the capital. The permanent population is estimated at 50,000, and the floating population at from 30,000 to 35,000. Addis Abeba was the scene of the signing of the treaty of peace between Italy and Abyssinia on Oct. 26, 1896, in which Italy resigned her claim to a protectorate over Abyssinia. See ABYSSINIA.

AD'DISON, DANIEL DULANY (1863—). An American clergyman and writer, born in Wheeling, W. Va., and graduated from Union College in 1883. After studying at the Episco-

pal Theological School, Cambridge, Mass., he was ordained to the priesthood of his denomination, becoming assistant rector of Christ Church, Springfield, Mass., in 1886. Three years later he was chosen rector of St. Peter's Church at Beverly, Mass., where he remained until 1895. He then became rector of All Saints Church, Brookline, Mass. A member of many church societies, and with varied interests, he gave especial attention to conditions in Liberia. He was made a trustee of the College of Monrovia and in 1904 was knighted by the government of Liberia in recognition of his services. Among his published writings are *Lucy Corcoran, Life, Letters, and Diary* (1894); *Phillips Brooks* (1894); *Life and Times of Edward Bass, First Bishop of Massachusetts* (1897); *All Saints Church, Brookline* (1896); *The Clergy in American Life and Letters* (1900); *The Episcopalians* (1904).

ADDISON, JOSEPH (1672-1719). An English poet and essayist. He was the son of Lancelot Addison, a clergyman of the Church of England, and was born at Milston, near Amesbury, in Wiltshire, May 1, 1672. After attending the Charterhouse and other schools, he entered Queen's College, Oxford, in 1687. Two years later he passed to Magdalen College. At Oxford he was distinguished for the ease with which he wrote graceful Latin verse. By 1697 he was receiving high compliments from Dryden. He won the favor of Montagu (afterward Lord Halifax), and Lord Somers, through whom he obtained, in 1699, a pension of £300 a year. The pension was probably intended to enable him to prepare himself for diplomacy by foreign travel. At any rate he left England toward the close of 1699 for a continental tour. While in France he became familiar with the language of that country. On the outbreak of the Spanish War of the Succession he went to Italy, where he wrote the most successful of his poems, the *Letter*, addressed to Lord Halifax. In the autumn of 1703 he returned home by way of Switzerland and Germany; but in his expectations of place he was disappointed, for the Whigs were out of office. The battle of Blenheim, however, which occurred the next year, presented a brilliant opportunity, which he did not fail to make the most of. The ministry wished the victory commemorated in verse, and Addison was appointed to do it. Lord Godolphin, the Treasurer, was so pleased with the first half of the poem that before *The Campaign* was finished he made Addison a Commissioner of Appeals.

The poet was now fairly involved in politics. He became Under-Secretary of State in 1706, accompanied Halifax to Hanover the next year, and in 1709 went to Ireland as Secretary to the Lord-Lieutenant, where he also obtained the office of Keeper of the Records, worth £300 a year. In the same year Sir Richard Steele began the *Tatler*, to which Addison soon became a frequent contributor. He also wrote a number of political articles in the *Whig Examiner*. On March 1, 1711, appeared the first number of the *Spectator*, which continued as a daily till Dec. 6, 1712. In 1714 it was revived as a tri-weekly. In 1713 appeared the *Tragedy of Cato*, the popularity of which, considering its total want of dramatic power, is amazing, though it contains some fine lines that have become almost proverbial. It was generally understood to have a political as well as a poetical inspiration; but so skillfully had Addison expressed himself that both parties, Whig and Tory, received its decla-

mations with rapture. It was translated into several European languages; and even the prince of French criticism, Voltaire, held Shakespeare a barbarian in tragedy compared with Addison. In 1716 Addison married Charlotte the Dowager Countess of Warwick. The marriage is said to have been "uncomfortable," but this legend is based upon no definite information, though it is generally accepted, and will be found in Thackeray's study of the poet. He reached his highest political position when he was appointed Secretary of State in 1717. For this place he was not at all suited, and he resigned the next year. Addison's health had been poor for some time, and, after an illness of a few months, he died at Holland House, Kensington, on June 17, 1719, three years after what Thackeray calls "his splendid but dismal union."

Thomas Tickell, whom Addison had appointed his literary executor, published his works two years later in four volumes, including, besides those already mentioned, papers Addison had written for the *Guardian* and the *Freeholder*, a play entitled *The Drummer*, *Dialogues on Medals*, and several poems. The most delightful and original of Addison's productions is that series of sketches in the *Spectator*, of which Sir Roger de Coverley is the central figure and Sir Andrew Freeport and Will Honeycomb the lesser ones. Sir Roger himself is an absolute creation; the gentle yet vivid imagination, the gay and cheerful spirit of humor, the keen, shrewd observation, and fine raillery of foibles which Addison has displayed in this character make it a work of pure genius. In prose, Addison is always excellent. He gave a delicacy to English sentiment and a modesty to English wit which it had never known before. Elegance, which in his predecessors had been the companion of immorality, now appeared as the advocate of virtue. His style, too, is admirable. There are many nobler and grander forms of expression in English literature than Addison's, but there are none comparable to his in propriety and natural dignity. "Whoever wishes," says Dr. Johnson, "to attain an English style, familiar but not coarse, and elegant but not ostentatious, must give his days and nights to the volumes of Addison." His various writings, but especially his essays, fully realized the purpose which he constantly had in view, "to enliven morality with wit and to temper wit with morality." He also did more than any other man of his time toward creating a wide public for literature. Consult: Johnson, *Lives of the Poets* (many editions); Macaulay, "Essay on Addison," *Edinburgh Review* (1843); Aiken, *Life of Addison* (London, 1843); Courthope, *Addison* (New York, 1884); and Beljame, *Le public et les hommes des lettres en Angleterre* (2d ed., Paris, 1897). The *Spectator* is edited by H. Morley (1868), and in eight volumes by G. Smith (1897-98). Addison's complete works are published in Bohn's *British Classics*.

ADDISON, JULIA DEWOLF (GIBBS) (1866—). An American art craftsman and author, born in Boston. After an early childhood spent in England, where she was privately educated, she returned to Boston in 1878, to study art. Further training in her profession she obtained in England and Italy. In 1889 she married Daniel Dulany Addison (q.v.), becoming widely known subsequently as a designer of ecclesiastical ornaments, metal work, mosaic, etc., and as an illustrator on vellum. Besides composing the

music for many songs and writing several Christmas carols, Mrs. Addison published the following: *Florestan the Troubadour* (1903); *Art of the Pitti Palace* (1903); *Classic Myths in Art* (1904); *Art of the National Gallery* (1905); *Arts and Crafts in the Middle Ages* (1908); *Mrs. John Vernon* (1908); *The Boston Museum of Fine Arts* (1910); plays, *A False Note* and *Blighted Buds*; *The Spell of England* (1912).

ADDISON'S DISEASE. A disease characterized by pigmentation of the skin and by degenerative changes in the suprarenal glands. The pigmentation of the skin varies from a light yellowish brown to a dark brown or blackish color. Various changes have been noted in the suprarenals, the most common being tuberculous inflammation. Fatty and waxy degenerations and carcinoma have also been described. The suprarenal glands, or adrenal bodies, were little understood till 1855, when Dr. Thomas Addison, of Guy's Hospital, London, published his work *On the Constitutional and Local Effects of Disease of the Suprarenal Capsules*. The leading symptoms of Addison's disease are anæmia, general languor and debility, feeble heart action, irritability of the stomach, and the peculiar bronzing (melasma) to which reference has been made. It is a rare disease, more common among the poor, more frequent in males than in females, and generally occurs between the ages of 30 and 50 years, although no age is exempt. There may be profuse diarrhœa, also rheumatoid pains in the loins and abdomen, and the temperature, as a rule, is subnormal. The bronzing is more pronounced on the face, neck, and backs of the hands and upon points of pressure. The disease lasts from 18 months to a few years. No curative treatment is known. Tonics, generous diet, proper climate, and the internal administration of suprarenal extract or the dried glands of sheep are beneficial and will often prolong life. See SUPRARENAL CAPSULES.

ADDISON'S WALK. In the grounds of Magdalen College, Oxford, a tree-bordered walk to which Joseph Addison is said to have frequently resorted when he was a "demy" in that college.

ADDITION. The process of uniting two or more number groups into a single group. In elementary arithmetic, which deals with natural numbers, the process of addition is simply counting all the units of two or more collections into a single collection. The different groups added are called the *addends*, and the result is called the *sum*. Since there is one and only one unit in the sum for every unit in the addends taken together, there is said to be a 1 to 1 correspondence between the sum and the addends. From this it appears that the sum is the same in whatever order the addends are taken or in whatever groups they may be placed. The former fact is expressed by saying that addition is commutative, and the latter by saying that addition is associative. See article ASSOCIATIVE LAW.

ADDLED PARLIAMENT, pär'li-ment, THE. A name given to the second Parliament of James I of England, 1614, because it did not produce a single statute. It holds, nevertheless, a noteworthy place in the history of constitutional liberty. Its members were chosen at a contested election, the first which had occurred for many years. The principle at issue was the right of



JOSEPH ADDISON
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Parliament to grant all supplies. It is significant that 300 members, or about two-thirds of the entire number, were then elected for the first time. Among these new men were John Pym and Sir Thomas Wentworth, each destined to take a leading part in the coming struggle. After a two-months' session the Parliament was dissolved by the King, because it declined to grant him a supply of money without a proper settlement of the question of the imposts.

ADDRESS', FORMS OF. See **FORMS OF ADDRESS.**

ADE, ād, GEORGE (1866—). An American humorist and playwright, born at Kentland, Ind. He graduated at Purdue University in 1887 and was in newspaper work in Lafayette, Ind., and Chicago from 1887 to 1900. His first mark as a writer was made in a column of the *Chicago News*, known as *Stories of the Streets and the Town*. He succeeded to Eugene Field's department in that journal. In *Fables in Slang* and other similar volumes, he showed considerable cleverness as a satirical humorist. In a somewhat similar vein he afterward wrote such plays and sketches as *The Sultan of Sulu* (1902); *Peggy from Paris* (1903); *The County Chairman* (1903); *The Sho-Gun* (1904); *The College Widow* (1904); *Just Out of College* (1905); *The Slim Princess* (1907); *The Fair Co-ed* (1908); *The Old Town* (1909); *Knocking the Neighbors* (1912).

A'DEE, ALVEY AUGUSTUS (1842—). An American official. He was born at Astoria, N. Y. In 1870 he was appointed Secretary of Legation at Madrid, and in 1878 chief of the Diplomatic Bureau at Washington. He served from 1882 to 1886 as Third Assistant Secretary of State, and in the latter year was promoted to be Second Assistant. He became known in diplomatic circles for his skill in writing diplomatic papers. It was he who drew up the points on which the Treaty of Paris was built after the war with Spain. He was acting Secretary of State during the Chinese trouble in 1900.

ADELAAR, ä'dē-lär (Norw. The Eagle). An appellation of Curt Sivertsen (1622-75), one of the greatest naval commanders of the seventeenth century. He was born at Brevig, in Norway, and in his twentieth year was employed in the naval service of Venice against the Turks. On one occasion he broke through a line of 67 Turkish galleys which surrounded his ship, sank 15, and burned several others. Frederic III engaged him as Admiral of the Danish fleet; and in 1675, under Christian V, he took the command of the whole of the Danish naval force against Sweden, but died suddenly at Copenhagen before the expedition set out. See Brunn, *Curt Sivertsen Adelaar* (Copenhagen, 1875).

AD'ELAIDE. The capital of South Australia, on the Torrens, 7 miles by rail from its port, Port Adelaide, on Gulf St. Vincent, and 508 miles northwest of Melbourne (Map: Australia, F 5). It has a large trade in agricultural produce and wool; lead and copper are mined in the vicinity, and its manufactories include iron foundries, potteries, tanneries, breweries, and woolen, starch, and soap factories. The Torrens, artificially converted into a fine river, spanned by several bridges, traverses a strip of park land which divides the town into North Adelaide, largely residential, and South Adelaide, the business portion. The streets are broad and regularly laid out. It is the seat

of a United States consular agent and the see of Anglican and Catholic bishops and contains numerous churches, a university, several colleges, a meteorological observatory, and extensive botanical gardens, including a museum of economic botany. Adelaide University, founded in 1872, had, in 1911, 642 students; and a library of over 25,000 volumes. There is a school of mines and industries. The town is almost surrounded by the reserved park lands half a mile wide. Large water works and reservoirs, from 6 to 7 miles distant, and the cemeteries, are the property of the South Australian government. There are municipal abattoirs. Area, 3700 acres, of which 1751 acres are public parks. Founded in 1836, the city was named after Adelaide, queen of William IV. Pop., 1911, 42,294; including suburbs, 189,646. Port Adelaide, its port, protected by two forts, has a safe and commodious harbor, with a dock for ocean steamers, and extensive quays; pop., 3386 (local government area, 24,015). Consult G. T. Ellery, "Greater Adelaide," in *Municipal Extension* (Adelaide, 1899); "City of Adelaide," in *Municipal Journal*, ix, 237 (London, 1900).

ADELAIDE, ä'dä'lä'éd', EUGÉNIE LOUISE (1777-1847). Princess of Orleans, sister of Louis Philippe. Proscribed in the Revolution as an *émigrée*, she sought refuge in the Netherlands, Switzerland, and Germany (1793). Ten years later she met her brother in Spain and was with him until the Restoration, using her influence to induce him to accept the crown. From 1830 to 1847 she played an influential part in politics.

AD'ELARD, or **ÆTH'ELHARD**, OF **BATH.** An English philosophical writer who lived about the beginning of the twelfth century. He is said to have studied at Tours and Laon. He traveled extensively in southern Europe, Asia Minor, and North Africa, and it was during these travels that he acquired the great knowledge of Arabian philosophy shown in his writings. His works include *Perdifficiles Quaestiones Naturales* (printed toward the end of the fifteenth century); *De Eodem et Diverso* (before 1116), an allegory in which worldliness and philosophy are represented as endeavoring to win the soul of man; and a Latin translation of *Euclid* (printed 1482), made at a time when that work was almost unknown in western Europe. He also translated and wrote several other treatises on mathematical and medical subjects which are to be seen in MSS. in the libraries of Corpus Christi and Trinity colleges, Oxford.

AD'ELBERT COL'LEGE. See **WESTERN RESERVE UNIVERSITY.**

AD'ELOCHOR'DA, äd'è-lô-kôr'dä, or **HEM'ICHOR'DA**, hēm'i-kôr'dä (Gk. ἄδηλος, *adēlos*, unclear, invisible + ἡμι-, *hēmi-*, half + Lat. *chorda*, a cord, a dorsal nervous cord). A subclass of the Chordata, including *Balanoglossus* and its allies. See **BALANOGLOSSUS**, and Plate of **ASCIDIANS.**

ADELPHI, ä-děl'fī. The latest of the six extant comedies of Terence (q.v.) It was produced in 160 B.C. at the funeral games of L. Æmilius Paulus, and was derived chiefly from the *Ἀδελφοί*, *Adelphoi* ('Brothers') of Menander, but also in part from the *Οἱ Συναποθνήσκοντες*, *Hoi Synapothnēskontes* ('Those who Die Together,' 'Comrades in Death') of Diphilus. Terence's play gets its name from two pairs of brothers who figure in it—the old men, Micio and Demea, and the young men, Æschines and Ctesiphon.

The two old men differ widely in character. The young men are sons of Demea, but one is adopted by Micio. Each father is sure he is bringing up his son aright, and that his brother is all wrong; the play proves both in the wrong. Molière is said to have owed to it the idea of his *Ecole des maris*.

ADEL'PHI, THE (from Gk. ἀδελφοί, *adelphoi*, brothers). A locality in London between the Strand and the Thames Embankment, a little distance east of Charing Cross. The name came from the fact that the Adelphi Terrace, which lies in it, was laid out in 1768 by the brothers Adam, whose names appear in Adam Street, James Street, William Street, John Street, and Robert Street.

ADELPHI COLLEGE. An American college, formerly Adelphi Academy, situated at Clifton and St. James Places and Lafayette Avenue, Brooklyn, N. Y. It was incorporated in 1896, and until 1912 admitted both men and women students as candidates for the degree of A.B. It grants also the M.A. degree. The college now consists of (1) a college for women; (2) a normal department for the training of kindergarten teachers; (3) an extension department, including courses in the entire college curriculum, for teachers in the public schools; (4) a summer session; (5) an art department. It has a library of 15,000 volumes; faculty, 1913, 34; students enrolled in regular college courses, 467; students in extension courses, 734. President, Charles H. Levermore, 1896-1912; acting president, S. Parkes Cadman, D.D., 1912.

ADELPHI THE'ATRE. A theatre on the Strand, London, more fully designated the Royal Adelphi Theatre. It dates from 1806, but was rebuilt on a larger scale in 1858. It was known chiefly for its melodramas and farces.

ADELSBERG, ä'dels-běrk (Sloven. *Postojna*). A small market town of the Austrian crownland of Carniola, 22 miles east-northeast of Trieste by rail (Map: Austria, D 4). It is a popular summer resort, but is famous principally for its wonderful stalactite cavern, the largest in Europe and one of the finest known. It may be explored for more than 2 miles, and is penetrated for about 800 yards by the river Poik, which then disappears in the bowels of the earth. The cavern consists of several different chambers. The largest is the Franz Josef and Elisabeth grotto, 223 yards in length by 214 yards in breadth. The stalactite and stalagmite formations are particularly notable for their beauty and variety. Pop., 1910, 3900.

ADELUNG, ä'de-lung, FRIEDRICH VON (1768-1843). A German philologist. He was born at Stettin, studied philosophy and jurisprudence at Leipzig, went later on to Russia, and was tutor to the Grand Duke, later Czar Nicholas. In 1824 he was appointed director of the Oriental Institute at St. Petersburg, and in 1825 president of the Academy of Sciences. He is chiefly known for his researches respecting foreign sources for Russian history, the most important results of which are embodied in the *Kritisch-litterarische Uebersicht der Reisenden in Russland bis 1700* (1846). He also wrote on Sanskrit language and literature such volumes as *Versuch einer Litteratur der Sanskritsprache* (1830), translated into English under the title *An Historical Sketch of Sanskrit Literature* (1832).

ADELUNG, JOHANN CHRISTOPH (1732-1806). A distinguished German linguist and

lexicographer. He was born at Spantekow, Pomerania; was a journalist and author at Leipzig from 1761 to 1787, and from 1787 until his death chief librarian of the Electoral Library at Dresden. He is principally known for his historico-critical studies of the German language and of Low Latin. His chief works are his *Grammatisch-kritisches Wörterbuch der hochdeutschen Mundart* (Dictionary of High German, 1808), in which he took Dr. Johnson as his model, and his *Ueber den deutschen Stil* (1785; 4th ed., 1800). His *Ueber den Ursprung der Sprache und den Bau der Wörter* (1781) is an important landmark in the early history of comparative philology. From 1784 to 1787 he was the continuer of Jöcher's *Allgemeines Gelehrten-lexicon*.

ADEMP'TION (Lat. *adimere*, to take away). The cancellation or reduction of a legacy either by voluntary act of the testator or by loss or destruction of the thing bequeathed. The term is properly used only in connection with legacies, although it is sometimes used interchangeably with advancement (q.v.), and some courts also treat the term as synonymous with satisfaction (q.v.). If a testator *in loco parentis*, before his death, made a gift to his legatee of the same kind as the legacy, the presumption is that the gift was made as part of, or in place of, the legacy; and it is, therefore, deemed *pro tanto*. Specific legacies may be deemed by the sale or alienation by the testator of the property bequeathed, or by its loss or destruction, and general legacies are deemed by lack of sufficient assets to pay them. See LEGACY.

ADEN, ä'den or ä'den. A peninsula and strongly fortified town near the southwestern end of Arabia, situated in lat. 12° N., and long. 45° 5' E., and connected with the mainland by a narrow sandy isthmus (Map: Asia, O 7). In a broader sense the name of Aden is applied to the whole British territory in that part of Arabia, which includes, besides the peninsula and the isthmus, a small strip of territory on the mainland, with a total area of 75 square miles, or with the island of Perim 80 square miles. Politically this is a part of the Bombay presidency, British India. The peninsula proper is of volcanic origin and reaches in the peak of Jebel Shan-shan an altitude of 1775 feet above the sea. The climate of the region is healthful, but the scarcity of rain makes cultivation of the soil impossible, so that all the necessaries of life have to be imported. Water is obtained partly from the wells within the crater in which the town of Aden is situated and partly from the hills. The town of Aden is strongly fortified. The most populous settlements are Steamer Point and Shaikh Othman on the mainland. There are two harbors, but only one of them, Aden Back Bay, on the western side of the peninsula, is of any commercial importance. Owing to its favorable location, Aden was of considerable importance already in Roman times, when it was an entrepôt for the trade between the Roman Empire and the east. In the beginning of the sixteenth century it was taken by the Portuguese, who were succeeded by the Turks in 1535. From the seventeenth century until the British occupation, Aden was under the rule of the Sultan of Sana and some native chiefs. In 1839 it was captured by the British as a punishment for the maltreatment to which the crew of a shipwrecked British vessel had been subjected by the natives in 1837. The great importance of Aden as a

coaling station and port of call began with the opening of the Suez Canal. The population, which in 1839 was less than 1000, was 43,974 in 1901 and 46,165 in 1911. The trade is principally one of transshipment. Exclusive of government stores and specie, imports and exports in the year 1911-12 were valued at £2,643,276 and £2,318,595, respectively. The chief articles of commerce are coffee, gums, hides, skins, piece goods, and tobacco. The territory is administered by a political resident, who is also the military commander. A territory of about 9000 square miles in Arabia, officially reckoned a British protectorate, Socotra, and the Kuria Muria Islands, are administered from Aden. An agreement defining the boundaries of the protectorate was concluded with the Turkish government in 1902, and the delimitation of the frontier was completed in 1905. Consult F. M. Hunter, *Aden* (London, 1877), and Lucas, *Historical Geography of the British Colonies* (Oxford, 1906-07).

ADENEZ, àd'nâ', or **ADANS LE ROI**, àdân' le rwä', also written ADENÈS and ADENET. A trouvère of the thirteenth century. He is first known as a minstrel at the court of Henry III, Duke of Brabant, whose reign ended in 1261. Later he was for a time in the service of Guy de Dampierre, Count of Flanders; then he went to France, where he was in high favor with the royal family. His surname of *le Roi* is commonly understood to have come from the authority which he exercised as leader of the minstrels at the Brabantine court. His greatest work is the *Cléomadès* (of which an edition was published in 2 vols., Brussels, 1863-66), a long poetical romance. Previously he had written a number of *chansons de gestes* from the epic cycle of Charlemagne, *Les enfances Ogier* (edited Brussels, 1874), and *Berte aus grans piés* (edited Paris, 1832), and also *Buèves de Commarchis* (edited Brussels, 1874). Consult: Comfort, "Adenet le Roi; the End of a Literary Era," in the *Quarterly Review*, vol. cexviii (London, 1913).

ADENIS-COLOMBEAU, àd'nè'kô'lôn'bô', JULES (1823-1900). A French dramatist. He was born at Paris and was educated at the College Bourbon (Lycée Condorcet). He wrote a large number of comedies and vaudevilles, as well as libretti for comic operas and operettas. Among his independent works are *Philanthropie et repentir* (1855); *Une crise de ménage* (1857); *Les chasseurs et la laitière* (comic opera in one act, music by Gevaert, Opéra Comique, Paris, 1865); *Les trois souhaits* (comic opera in one act, music by Poise, Opéra Comique, 1874). In collaboration with Plouvier, Decourcelle, Tourte, Granvallet, Rostaing, and others, Adenis-ColombEAU produced works, of which the following are the more important: *Madame Pygmalion* (Bouffes Parisiens, 1863); *La jolie fille de Perth* (opera in four acts, music by Bizet, Théâtre Lyrique, 1867); *La czarine* (drama in five acts, Ambigu, 1868); *La fée des Bruyères* (Brussels, 1877); *Les templiers* (opera in five acts, Brussels, 1886).

ADENITIS, àd'è-nī'tis, or **LYMPHADE-NITIS**, lim'fād- (Gk. *ἀδὴν*, *adēn*, gland; Lat. *lymphā*, water). An inflammation of the lymphatic glands. Lymphangitis is inflammation of the lymphatic vessels which lead into and bind together these glands. In both structures the inflammation may assume an acute or chronic form. Acute lymphadenitis and lymphangitis usually take their origin from a wound or from some form of sore on the skin or a mucous mem-

brane. The inflammatory process extends from the initial lesion along the chain of lymphatic vessels, and its presence is indicated by bright red lines over the course of the lymphatic vessels leading from the wound, and by heat, swelling, pain, and tenderness in the glands with which these vessels communicate. If infective microorganisms, bacteria, are present at the time of the injury, or subsequently find their way into the tissues, a suppurative inflammation results, and pus is formed in and around the affected glands. Where the inflammation is severe, or the infection intense, such general symptoms as fever, headache, vomiting, and prostration are present. The chronic forms of adenitis are usually due either to tuberculosis or syphilis. In addition to the local enlargement of the glands, and the softening and suppuration that often follows, are found the general symptoms of the two diseases named. The treatment of acute adenitis consists in putting the affected part at rest, using such bandages and supports as may be necessary, the application of moist antiseptic dressings, the use of a non-stimulating diet and of laxatives. If suppuration ensues, an incision must be made and the pus allowed to escape. The chronic forms of adenitis are met by tonic and constitutional treatment, and, when this is unsuccessful, surgical removal of the enlarged glands is indicated.

AD'ENOID, ADENOIDS (Gk. *ἀδὴν*, gland; *εἶδος*, resemblance); also called POST-NASAL or ADENOID VEGETATIONS, NASO-PHARYNGEAL TONSIL, LUSCHKA'S TONSIL. A term now generally applied to an excessive growth of spongy tissue in the naso-pharynx, that region lying above and back of the soft palate. This growth begins in early infancy, often being well developed at the age of three months, and continues, if not removed by operation, until puberty. During the first few years it is of a soft, spongy nature, prone to bleed easily, but becomes harder and more fibrous as adult life approaches. It is frequently accompanied by enlarged tonsils and swollen cervical glands, but is not confined to the tubercular.

Adenoid tissue is present in the normal child and becomes detrimental only when it takes on an unusual growth. This enlargement, or hypertrophy, is due to various causes, among which heredity undoubtedly plays an important rôle. Bad hygienic surroundings, improper feeding, poor ventilation, dust-laden air, and indeed any condition causing a lowered systemic resistance predisposes to its development, but it is common in all classes and in all climates. Adenoids cause such a narrowing of the air passage that breathing through the nose is difficult or impossible. This, in aggravated cases, gives rise to a characteristic facial expression with open mouth and a drawn, vacant, semi-idiotic look. The difficult nasal respiration prevents symmetrical growth of the facial bones, so that the upper jaw may become narrowed, the teeth misshapen, and the hard palate unduly arched. Mentally the child is sluggish, inattentive, and unable to concentrate his attention on anything for more than a few minutes. This condition is termed *aproxia*. By preventing proper inflation of the lungs the chest becomes flat and deformed. And because the indrawn air is not purified of dust and germs by passing through the nose, the child is subject to colds, bronchitis, tuberculosis, and pneumonia. Asthma is not infrequently associated with adenoids. In the

nursing infant sucking becomes difficult. Sleep is impaired and is often interrupted by attacks of smothering. In older children mouth-breathing is the rule, especially at night, with snoring and "night-terrors," the latter due to semi-suffocation.

Adenoids cause a swollen, congested condition of the mucous membrane lining the nose and throat, thereby producing an excessive secretion of mucus, or catarrh. The "snuffles" in young children, and cough or hawking in the older, are usually due to this disease. There is a tendency to nosebleed and to bleeding from the mouth. The voice becomes thick and unmusical, with a nasal quality. An important and common complication is the blocking up of the eustachian tubes. These tubes, one on either side, lead from the naso-pharynx to the ear, and maintain an even air pressure within the ear drums. Any impairment of them causes deafness, earache, or abscess. In this way, by preventing proper ventilation of the drums, adenoids become the main cause of deafness and of "running" ears. Digestive disturbances, vomiting and catarrh of the stomach and intestines, may be caused by the constant swallowing of mucus. During the infectious diseases this growth adds a serious menace. Indeed the presence of these vegetations hinders the entire mental and physical development of the child.

Except in cases of deformed palate adenoids cannot be seen by direct vision. Rough or granular masses of tissue appearing on the back wall of the throat are suggestive, however, and the medical examiner can easily confirm the diagnosis with his finger or, in older children, by means of a small mirror.

Treatment consists in the early and complete removal of the growth, preferably under a general anæsthetic. Any other treatment is useless and often means a serious loss of time. If the diseased condition is sufficient to cause any of the symptoms mentioned, then the sooner surgical aid is invoked the better. The operation in skilled hands is practically without danger, the slight risks being from the anæsthesia and from possible hemorrhage. The latter is serious only in bleeders, on whom no operation should be attempted. Many cases undoubtedly get well without treatment, but always at a serious risk to the child.

Recurrence of the disease is frequent under the age of four years, especially following measles and whooping-cough, and in children with nasal obstruction.

The timely removal of adenoids causes, in the great majority of cases, a marked mental as well as physical improvement. The child's mind becomes more active, and he increases in weight and strength. If, however, operation be delayed until bone development has largely progressed, the benefits are not so great, and mouth-breathing may become a fixed habit. In the older children and young adults, however, it is important to remove the growths if for no other reason than in the hope of preventing deafness.

Although little was known of this disease until recent years, it has probably always existed in the human race. See THROAT.

ADERBAIJAN, ä'dër-bi-jän', or **ADERBIJAN**. See AZERBAIJAN.

ADERNÒ, ä'dër-nò'. A city of Sicily, 23 miles northwest of Catania, southwest of Mount Etna, and 1905 feet above sea level (Map: Italy, J 10). The ancient Hadranum was founded by Dionys-

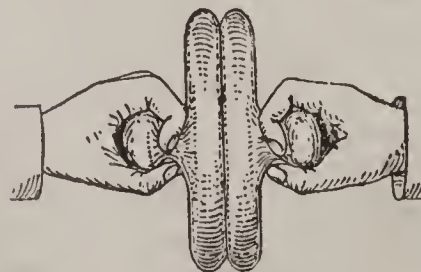
ius I about 400 B.C. Among interesting ruins near by are fragments of the Sikelian temple of Hadranos, reputed to have been guarded by 1000 dogs, and remains of the Ponte Carcari, an aqueduct. Roger I founded, in 1157, the convent of Santa Lucia. A Norman castle, also erected by him, still stands and is used as a prison. Fragments of frescos still extant represent Adelasia, Roger's granddaughter, taking the veil. In 344 B.C. Hicetas of Syracuse was defeated here by Timoleon. Adernò is the market town of a flourishing agricultural district. Pop., 1901, 25,689; 1911, 30,190.

ADERSBACH ROCKS, ä'dërs-bäk. A group of sandstone rocks near the village of Adersbach, on the northeastern frontier of Bohemia. They are about 4 miles long and over 1 mile in width, and rise in some parts over 200 feet. They are remarkable for their fantastic form, which has been produced by the rain, frost, and other atmospheric agencies. During the Thirty Years' War the miserable people of Bohemia often found refuge in this locality.

ADHEMAR DE CHABANNES, ä'de-mär' de shä'bän' (c.998-1034). French monk and author. He was born at Chabannes, now in the département of Haute Vienne, and was educated at S. Martial in Limoges. He wrote several works concerning S. Martial; but his chief production was a chronicle in three books, extending to 1028. This work was formerly unjustly condemned because of fabulous additions by later copyists; the last of the three books is a very useful historical source. For the value of the various editions, see Molinier, *Les Sources de l'histoire de France*, vol. ii (Paris, 1902). His other works are published in Migne: *Patrologia Latina*, vol. cxli. Adhemar died, in 1034, at Jerusalem while on a pilgrimage.

ADHER'BAL. Eldest son and one of the heirs of Micipsa, King of Numidia, who died 118 B.C. He was killed by order of Jugurtha (q.v.) six years after his father.

ADHE'SION (Lat. *adhesio*, a sticking to, from *ad*, to + *hæerere*, to stick). The phenomenon observed when two bodies are brought into close contact, viz., they become so attached to each other that it requires force to separate them. Adhesion is seen in the case of two solid bodies when their polished surfaces are pressed together, as in the case of the two



ADHESION.

lead disks shown in the illustration; but it is more evident between solids and fluids, owing to their intimate contact. We have instances of this in the film of water adhering to a piece of glass which is dipped in water and then removed. The adhesion of gases to the surface of solids plays an important part in many processes. A condensed atmosphere of gases surrounds every body, and every particle of a powdered or porous body has its own surface layer of gases. This property of powdered bodies to retain gaseous atmospheres in a state of great condensation is called adsorption.

ADHESION, IN PATHOLOGY. The term sometimes refers to the closing of a wound. If two granulating surfaces (see GRANULATION) be kept in contact, they may fuse and the wound unite by secondary adhesion—"second intention."

Serous membranes, such as the pleura, pericardium, and peritoneum, when inflamed often become adherent. After operation involving any of these membranes similar inflammatory adhesions may occur. In inflammations of the appendix vermiformis (see VERMIFORM APPENDIX) and the pelvic organs (see UTERUS; OVARIES; FALLOPIAN TUBES), more or less extensive adhesions are apt to occur, interfering with the free motion of the organs or actually drawing them out of proper position.

ADHESION, IN PLANTS. The term is sometimes applied to an apparent coalescence of adjacent cycles; e.g., stamens which seem to be borne upon the tube of the corolla are called "adherent." The term is now passing into disuse.

ADIABATIC, äd'i-ä-bät'yk. Without transfer of heat. See THERMODYNAMICS.

ADIABENE, ä'dê-ä-bē'nê. An ancient kingdom, originally the territory between the Tigris and its two tributaries, the Upper Zab (Lycus) and the Lower Zab (Caprus), called by the Aramæans Hadyab, but later including all of Assyria proper as well as temporarily the Mesopotamian province of Nisibis and the district of Ecbatana to the southeast. Before he came upon the throne of Persia Artaxerxes III Ochus (359-336 B.C.) bore the title "King of Hadyab." To judge from the names of the kings in Arsacid times, the dynasty must have been Macedonian. At the end of the first century B.C. Monobazus I reigned over Adiabene. His wife, Helena, became a convert to the Jewish religion. About 25 A.D. their son Izates, who succeeded his father, also became a Jew. Helena moved to Jerusalem about 43 A.D. Izates died 55 A.D. and was succeeded by Monobazus II, who also was a Jew. He erected a mausoleum north of Jerusalem to his mother and other members of the family. It has been identified with the so-called "Tombs of the Kings," where two inscriptions have been found, one giving the name "Zaddan, the Queen," in Estrangelo and square Hebrew, the other "Helena" in square Hebrew. In 61 Monobazus II assisted Tiridates against Tigranes. Meharaspes was King of Adiabene in 116 A.D., when the country was conquered by Trajan, who made it a Roman province under the name of Assyria. Hadrian, however, allowed it to resume its semi-independence under Parthian suzerainty. Septimius Severus conquered Adiabene in 195 A.D. and assumed the title "Adiabenicus." After the war of 297 Diocletian and Maximian assumed the title "Adiabenicus maximus," and as a result of the war of 338 Constantius II claimed the same title. The capital of the kingdom was Arbela (q.v.). Consult Grütz, *Geschichte der Juden*, vol. iii. 2, pp. 403, 783 (4th ed., 1888); Marquardt, *Römische Staatsverwaltung*, vol. i, pp. 435 (1881); Schürer, *Geschichtedes jüdischen Volkes*, vol. iii, p. 169 (4th ed., 1909).

AD'IAN'TUM. See MAIDENHAIR.

AD'IAPH'ORISTS (Gk. *ἀ*, *α*, priv. + *διάφωρος*, *diaphoros*, different). The name given to Melancthon and those who agreed with him in submitting, in "things indifferent," to an imperial edict. When, in 1548, Charles V issued an edict called the Augsburg Interim, relating to disputed religious doctrines, Melancthon drew up the Leipzig Interim, in which he yielded several doctrinal and liturgical points as *adiaphora*, "things indifferent." This stirred up a vigorous controversy, which lasted till the adop-

tion of the Formula of Concord (1577), which lays down the law on the matter.

ADI-BUDDHA, ä'dê-bud'dä (Skr. the primordial Buddha). A conception of the supreme deity which arose about the tenth century and prevails especially among the northern Buddhists. He is the spiritual source out of whom through successive emanations of the five Dhyani Buddhas (q.v.) and their less perfect Bodhisattvas (q.v.) came all the visible creation. The similarity of this view to certain Gnostic theories has suggested that it may have been indirectly affected by contact with Eastern Christianity. See BUDDHISM.

ADIGE, ä'dê-jä (ancient *Athesis*). A river of Austria-Hungary and Italy, rising in the Rhetian Alps of Tyrol (Map: Italy, F 2). It is formed by the union of numerous streamlets near Glarus, where it is called Etsch, a name by which the entire river is known in Germany. It flows in a general southerly direction past Meran and Trent, entering Italy midway between Rovereto and Verona. A few miles above the latter town it turns to the southeast and subsequently enters the Adriatic north of the mouth of the Po. Its total length is 250 miles, for 180 of which it is navigable, although not without difficulty, owing to its swift current. It is connected with the Po by a small navigable canal called Adigetto. Its most important tributaries are the Eisack and the Avisio. The Adige is a transit river for the trade of Germany and Italy.

ADI-GRANTH, ä'dê-gränth, primal book. The Bible of the Sikh religion (see SIKHS). It consists largely of poems and legends originating with Nanak (1469-1538 A.D.), the founder of the sect, and the *gurus* ('divine revealers') who immediately succeeded him, its materials having been collected by Arjun (1584-1606), the fourth of these successors. Many of its passages show a very elevated conception of the deity and deal with such problems as predestination, the freedom of the will, etc. Its ethical teachings are notably such as combat the sins of personal selfishness and attachment to the pleasures of the world. A second granth ('book'), known as the "Granth of the Tenth Reign," was composed in 1696 under the direction of Govind Singh, the last of the ten *gurus*. This more especially exalted the martial virtues and added further legends of the incarnation of God. The sacred books are treated with great veneration in the assemblies of the Sikhs.

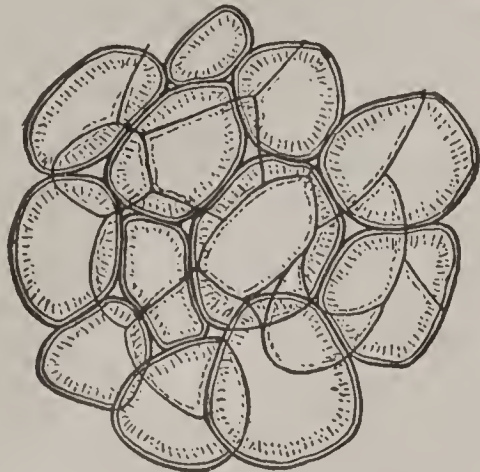
ADIPIC, ä-dip'ik, **ACID** (COOH)CH₂CH₂CH₂CH₂(COOH). A dibasic acid similar to oxalic acid. It is often obtained in the oxidation of fats by nitric acid. Its derivatives, the stereoisomeric tetra-oxy-adipic acids (COOH).CHOH.CHOH.CHOH.CHOH.(COOH), are close relatives of the simple sugars (mono-saccharides).

ADIPOCERE, äd'i-pô-sēr' (Lat. *adeps*, fat + *cera*, wax). A peculiar mixture of fatty acids resulting from the decomposition of animal bodies buried in moist places. Its formation has been supposed by some investigators to prove the change of nitrogenous tissues into fats, but this has been much disputed.

ADIPOSE SUBSTANCES (Lat. *adeps*, fat, grease). Same as fats (q.v.).

ADIPOSE TISSUE. A variety of animal tissue consisting of an aggregation of vesicles filled with fat or oil and supported partly by areolar tissue, but chiefly by a fine network of capillary blood-vessels. Each droplet of fat is

contained within a delicate protoplasmic envelope thickened at one part, where a flat nucleus is found. The vesicles are round, oval, or, when closely packed, polyhedral, from mutual compression. The supporting tissue is organic and vital, the vesicles secreting fat from the



ADIPOSE TISSUE (MAGNIFIED).

capillary blood-vessels; the secreted product—the fat—is unorganized and devoid of vitality. Adipose tissue differs from cellular tissue in having the vesicles closed, so that the fat does not escape even when fluid. There is a considerable layer of adipose tissue immediately under the skin; also around the large vessels and nerves, in the omentum and mesentery, around the kidneys, joints, etc. See FATS.

AD'IPO'SIS DO'LORO'SA, See OBESITY.

AD'IRON'DACKS. A group of mountains in northeastern New York. They lie west of the main axis of the Appalachians, as represented in the Green Mountains of Vermont, and constitute quite an independent mountain system. The name Adirondack is applied in a wider sense to that area embracing about 12,500 square miles contained between the valley of Lake Champlain, the St. Lawrence, and the Mohawk rivers. The counties of Essex, Clinton, Franklin, St. Lawrence, Lewis, Herkimer, Hamilton, and Warren lie partly or wholly within its limits. The more mountainous portion is on the east, and the higher peaks are chiefly within Essex County. From northeast to southwest the individual mountains become less pronounced, and the surface grades into a plateau of 1500 to 2000 feet altitude. Two peaks, Mount Marcy (5344) and Mount McIntyre (5112) are the highest in the State, while several others, Whiteface, Dix, Giant, Haystack, Skylight, and the Gothics, are but little lower. The mountains are grouped in minor ranges, which run a little east of north, and which are separated by deep, often narrow, valleys, as the depressions of Lake George, of the Schroon-Boquet rivers, of the Boreas-Ausable, and other rivers. The ranges approach Lake Champlain, *en échelon*, and produce on the lake shore a succession of bold, rocky headlands and open, receding bays and valleys. As a rule, the mountains are dome-shaped in their outlines; but some sharp peaks, like Whiteface, exist. Precipitous escarpments over 500 feet high are common. Thus picturesque passes occur which are a delight to travelers. The best known are Wilmington Notch, Indian Pass, and Avalanche Pass. Deer's Leap and Roger's Rock on Lake George are similar.

Drainage. The mountains constitute the water-shed between the Hudson and the St. Lawrence drainage systems, but the actual divide is a very irregular line that is due to the glacial drift. Thus Lake Champlain and Lake George

rise far to the south and discharge into the St. Lawrence; small ridges of drift alone separate them from the Hudson, which rises a hundred miles to the northwest of the heads of their basins and flows around their southern ends. In the heart of the mountains rocky divides of older date separate the streams. The main tributaries of the Hudson are the Sacondaga, Schroon, Boreas, and Indian rivers. The Mohawk receives East and West Canada creeks. The Black River carries to Lake Ontario the contributions of the Moose, Beaver, and several minor streams. The Indian, Oswegatchie, Grass, Raquette, St. Regis, Salmon, and Chateaugay flow into the St. Lawrence. The Chazy, Saranac, Ausable, and Boquet discharge into Lake Champlain. In the eastern portion all these streams follow the northeast-southwest structural lines until they can break across the ridges to the great lines of drainage.

Lakes. The region has many lakes. The largest are lakes Champlain and George, but hundreds of smaller ones add an indescribable charm to the scenery. The greater number are due to barriers of glacial drift that block the streams. Often they run in chains, apparently indicating former great lines of drainage. The Fulton chain, Raquette, Forked, Long, and Saranac lakes are strung out in a northeast and southwest series and are familiar summer resorts.

Geology. The Adirondack region is formed almost entirely of ancient Pre-Cambrian crystalline rocks. Gneisses and coarsely crystalline igneous varieties abound, and many smaller areas of crystalline limestones and quartzites are present. The gneisses and crystalline limestones are without doubt equivalents of the Grenville series of Canada. The most abundant igneous rocks are anorthosites, or labradorite rocks, and syenites. All the higher peaks are formed of the labradorite rocks. Basaltic and trachytic dikes, usually but a few feet wide, often intersect these older rocks. On the borders of the ancient crystallines, and on the southeast, as rare exposures from 25 to 40 miles from their edges, are the Paleozoic sediments, beginning with the Potsdam sandstone of the Cambrian system and terminating with the Utica slate of the Ordovician. All the Paleozoic rocks dip at low angles, and while small folds may be sometimes seen, the strata usually appear in faulted blocks. No rocks are found between the Utica slate and the glacial deposits of the Pleistocene period, so that the geological history of this long space of time can only be imperfectly inferred from the physiography. The great ice sheet moved from the northeast to the southwest and covered the highest summits. It spread a mantle of sand and boulders all over the region. On its melting many temporary lakes were formed, of which beaches and deltas are often found. During the Champlain submergence clays were deposited in great quantities in the Champlain valley.

Flora. The flora is of a pronounced northern character as compared with that of southern New York, but it naturally varies with the altitude. On the higher summits many small boreal plants remain as relics of the glacial epoch. The tree distribution is significant. Chestnuts penetrate only the southern and lower and more open valleys, whereas the spruce is found only at 1000 feet and more above the sea.

Fauna. The animals are likewise those of the north. Moose, though once abundant, are

now exterminated. Black bears are frequent, and deer are numerous because protected by game laws. The smaller animals are those characteristic of the north. Of fish, black bass and brook trout are most sought, and in the larger lakes lake trout are frequent. Salmon are now extinct.

Resources. The Adirondacks contain vast deposits of iron ore, chiefly magnetite, which is extensively produced near Port Henry, on Lake Champlain, at Lyon Mountain on the north and at the Benson mines on the west. The region was once the home of the bloomery process, but almost all the old forges are in ruins. At the head waters of the Hudson on Lake Sanford there are immense bodies of titaniferous magnetite not as yet utilized. Building stone in the form of green granite has been quarried near Keeseville, and a highly prized sandstone is produced near Potsdam on the northwest. Marble is found near Gouverneur on the west, and to some extent in the Champlain valley. Talc is extensively mined near Gouverneur. Graphite occurs in the vicinity of lakes George and Champlain.

The products of the forests form the most important industries. For lumber, the pine trees have been practically exhausted; spruce is the chief wood sought. The paper-pulp mills, however, consume much more than do the saw-mills. They take either spruce or poplar. The former is stripped from the mountains, where it may not grow again, but the latter rapidly renews itself upon the sandy barrens. After the timber has been cut off, and more especially in earlier years, when the outer mountains were stripped for charcoal, the owners often allowed the taxes to remain unpaid until the tracts were sold by the State at public auction. The State itself has at these times acquired extensive possessions, to which it adds yearly, with a view of preserving the waterways and forming a great public park for the people, and now possesses a million and a half acres. Enormous tracts are also held by private individuals and clubs as recreation grounds. Forestry has received much attention from the State authorities, and the denudation of the mountains by lumbermen has been materially checked.

Summer Resorts. The Adirondack region is one of the most important places for summer recreation for the dwellers in cities of the northeastern United States, and many thousands turn annually to it. Lake George, Schroon Lake, Lake Placid, the Saranacs, the Fulton chain, Long Lake, the Keene valley, and dozens of other localities attract their habitual visitors. The climate is especially adapted to the treatment of pulmonary complaints, notwithstanding extremely low temperatures in winter, frequently reaching -30° or -40° F. Saranac Lake, with its well-known sanitarium, is the chief resort. The establishment of State sanitariums has received favorable consideration from the State government.

Bibliography. For geology and mineral resources, see *Reports of the New York State Geologist*, and *Bulletins of the New York State Museum*, especially those since 1888, containing papers by J. F. Kemp, C. H. Smyth, Jr., H. P. Cushing, and others. For botany, see *Reports of the State Botanist*, and especially *Bulletin 28 of the State Museum*. For forestry, see *Reports of the State Forestry Commission*. All these are published at Albany.

AD'IT (Lat. *aditus*, access, approach). A

nearly horizontal passage opened for the purpose of prospecting, entering, draining, or ventilating a mine or mining district. If the opening is driven across the formation, it is called a *cross-cut adit*. In the United States these passages are usually called tunnels, though the latter term, strictly speaking, applies when the opening passes through the hill and is opened at both ends. Very few adits warrant the expense of driving unless they are for drainage purposes where water from the ground above can be intercepted or the water from the ground below can be raised to the adit and discharged through it, thereby saving the extra cost of raising the water from the adit level to the top of the shaft. In the rich silver mines of Japan, before the invention of power pumps, as many as 1500 men were employed at a single property for handling the water, which later was drained by the driving of an adit. The adits to drain the Sado Mine in Japan were started in 1629 and completed in 1639; the length was only 2880 feet. Numerous other short adits were driven in Japan about this time for drainage and ventilation which required many years to complete. An adit in Cornwall opens at the level of the sea, and extends inland about 30 miles, draining the district of Gwennap. It meets some shafts at the depth of 400 feet. The Ernst August adit in the Hartz Mountains is 13 miles long. The Joseph II adit at Schemnitz, in Hungary, is 10 feet high, $5\frac{1}{4}$ feet wide, extends 10 miles to the valley of the Gran, and is used as a canal and railway passage. The Sutro Tunnel, driven for the purpose of draining and ventilating the Comstock Mines in Nevada, is a cross-cut adit, 4 miles long. The water and air of these mines were so hot that it was difficult to keep labor at work more than one or two hours at a time. The Roosevelt Tunnel at Cripple Creek, Colo., which is also a cross-cut adit, was driven for the purpose of prospecting the formation and draining of the entire district. The New-house Tunnel at Idaho Springs was driven to prospect the ground, drain the upper workings, and serve as a means for entering and conveying ore to the railroad. For a description of early adits, consult vol. xliii of the *Transactions of the American Institute of Mining Engineers*; also, *Handbook of Mining Details*; compiled from the *Engineering and Mining Journal* (New York, 1912).

ADIVE, à-div'. The Tibetan fox. See Fox.

ADJECTIVE (Lat. *adjectivum*, from *ad*, to + *jacere*, to throw, add, literal translation of the Gk. *ἐπιθετικόν*, *epithetikon*, something added). One of the parts of speech in grammar, a word joined to a substantive to extend its meaning and to limit its application. When *tall* is joined to *man*, there are more properties suggested to the mind by the compound *tall man* than by the simple name *man*; but *tall man* is not applicable to so many individuals as *man*, for all men that are not tall are excluded. Adjectives are variously classified. The following classification is simple and sufficiently complete: Descriptive adjectives, or adjectives of quality and of quantity, and pronominal adjectives. The articles (q.v.) are sometimes included in this class. Nouns, or names of things, are often used in English as adjectives; thus, we say a *silver chain*, a *stone wall*. In such expressions as "income-tax assessment bill," *income* plays the part of an adjective to *tax*, which is, in the

first place, a noun; the two together then form a sort of compound adjective to *assessment*; and the three, taken together, a still more compound adjective to *bill*, which, syntactically, is the only noun in the expression. Languages differ much in their way of using adjectives. In English the usual place of the adjective, when it is not in the predicate, is before the noun. This is also the case in German; but in French and Italian it may follow. In these languages, again, the adjective is varied for gender and number, and in the German for case also. In English it is now invariable, and in this simplicity there is a decided superiority; for in modern languages these changes in the adjective serve no purpose. The only modification of which the modern English adjective is capable is for degrees of comparison.

ADJECTIVE COLORS. Those colors in dyeing which are fixed by a base or mordant to render them permanent, as distinguished from *substantive colors*, in which the dye in its natural hue is fixed without the use of a mordant.

ADJECTIVE LAW. The term applied to the rules of law relating to procedure, as distinguished from substantive law (see **SUBSTANTIVE LAW**), which is the term applied to the common law rules of right which courts are called upon to enforce. Thus, the rule that the owner of real estate is entitled to recover damages for trespass upon it is a rule of substantive law; but the rules determining to which court he should apply for relief and the method he should adopt to obtain it are rules of adjective law. Adjective law thus comprehends the law of the forum, including the conflict of laws, pleading, evidence, rules regulating admission to the bar, and rules for the conduct of cases in and out of court. Consult Holland, *The Elements of Jurisprudence* (9th ed., London, 1900; New York, 1910).

ADJOURNMENT (Lat. *ad* + Fr. *jour*, belonging to the day). In law, the suspension or winding up of a term or session of a court, as distinguished from the suspension or postponement of a pending cause, which is technically known as a continuance (q.v.). Adjournment may be to a designated time, as from day to day, or it may be indefinite, in which case it is said to be "without day." The suspension of a session to be resumed on the same day is not called an adjournment, but a recess. An adjournment is in the discretion of the court and cannot ordinarily be inquired into by any other tribunal unless the discretion has been abused. The power of adjournment is an inherent attribute of judicial tribunals. Ordinarily the suspension of a judicial sitting at the close of a day to be resumed the next day does not call for an order of adjournment, the session being deemed continuous until the end of the term.

ADJU'DICATION (Lat. *adjudicare*, to adjudge). In the most general sense the judicial determination of a controversy. Specifically, in English and American law, the term is used to denote the final determination of a proceeding in bankruptcy. In the Federal Bankruptcy Act of 1898 it is defined as "a decree that the defendant, in a bankruptcy proceeding, is a bankrupt." The phrase "former adjudication" is often used, the rule being that persons shall not relitigate a matter which has been the subject of a former adjudication between them. See **JUDGMENT**; **RES JUDICATA**; and the authorities there referred to.

ADJUNTAS, *ád-hōon'thás*. A mountain resort in Porto Rico, one of the healthiest and most pleasant towns on the island. It is in the central part, 15 miles northwest of Ponce, and is about 2400 feet above sea level. It is surrounded by coffee and fruit farms. Adjuntas was visited by a disastrous hurricane in 1899. Pop., 1899, 1963; 1910, 1406.

ADJUSTMENT. In the law of insurance, the act of ascertaining the exact amount of indemnity which the party insured is entitled to receive under the policy and of fixing the proportion of the loss to be borne by each underwriter. The nature and amount of damage being ascertained, an indorsement is made on the back of the policy, declaring the proportion of loss falling on each underwriter, and on this indorsement being signed by the underwriters the loss is said to have been adjusted. There has been some difference of opinion as to the nature of the obligation incurred by the underwriter upon agreeing to and subscribing to the adjustment; but it is now settled that the act is not absolutely conclusive upon him, but creates only a contract obligation, from which he may free himself upon proof of fraud, mistake, misrepresentation, etc. For the particular applications of the doctrine to marine insurance, where it is of most importance, see **AVERAGE**. Consult Arnould, *On Marine Insurance* (London, 1901; Boston, 1909). See **INSURANCE**.

ADJUTANT (Lat. *ad*, to + *jutare*, to assist, help). A staff officer. In the United States army, generally a regimental officer of captain's rank appointed by the regimental commanding officer to assist him in the training, discipline, and duties of his command, together with the general supervision of its interior economy. Squadron and infantry battalion adjutants appointed from the lieutenants and field artillery battalion adjutants appointed from captains have similar duties in a more limited degree and sphere. Post, garrison, artillery district, brigade and division adjutant majors have similar relationship to their respective commanding officers. The duties of the position are practically the same throughout the armies of all the great powers. In the United States the regimental adjutant is appointed for a term of four years and the squadron or battalion adjutants two years. Such officers are not eligible for re-appointment, except under certain specified conditions. The application of these regulations was modified by the detached service law of 1912 ("Manchu Law"), which provided that all line officers below the grade of field officer must actually serve two years out of six with a troop, battery, or company of the arm of the service in which they are permanently commissioned. For a description of their duties, consult the *United States Army Regulations*.

ADJUTANT (for origin of name, see above). A large East Indian stork (*Leptoptilus argala* or *dubius*), about 5 feet high and 5 feet in length. It is chiefly white, but the back and wings are slate-colored, and the head and neck bare and flesh-colored, marked with black. From the front of the neck hangs a long pouch, which is connected with the respiratory system and possibly serves as an air-reservoir under special conditions. "Adjutant" is really a nickname given to these birds, because of an absurd resemblance at certain times to a self-important army officer. The adjutant is very voracious, and though it is especially fond of fresh meat,

its chief source of food is in carrion and offal. It is, therefore, an efficient scavenger, and since it also eats many of the smaller noxious animals, it is protected by law in India. Although so large a bird, its powers of flight are considerable, and it soars to great heights, mingling with vultures in its search for food. The adjutant is found in India and southeastern Asia, a smaller species (*L. javanicus*) occurring in the East Indies. A closely allied species, the marabou (q.v.), inhabits Africa. All three furnish the marabou feathers of commerce, their lengthened under tail and under wing-coverts being of unusual beauty.

ADJUTANT-GENERAL. A military staff officer with the rank of colonel, one of the assistants of the commanding general of a field army in the execution of his military duties, as in issuing and executing orders, receiving and registering reports, regulating details of the service, and so forth. In the United States army there is also a department known as the *Adjutant-General's Department*, all the officers of which are above the grade of captain and who have, in addition to the title of adjutant-general, the specific title of brigade adjutant or division adjutant when serving as such with a brigade or division in the field. The chief of the adjutant-general's department has the rank of brigadier-general and the title of "the adjutant-general." The adjutant-general is an important officer of the War Department (see ARMY ORGANIZATION), having the rank of brigadier-general. His duties include the management of the recruiting service, the collection of military information, the preparation of annual returns of the militia, the custody of all records, etc. Most of the individual States also have adjutant-generals, performing similar duties with respect to the militia of their several States.

ADLER (*Ger. pron.* äd'lër), CYRUS (1863—). Founder of the American Jewish Historical Society. He was born at Van Buren, Ark., graduated at the University of Pennsylvania (1883), became associate in Semitic languages at Johns Hopkins, and in 1892 librarian of the Smithsonian Institution. As special commissioner for the World's Columbian Exposition at Chicago, he spent fifteen months in Egypt, Turkey, Servia, and Persia in 1890-91, and obtained most of the Oriental collections for that exhibit. He was chosen one of the editors of the *Jewish Encyclopædia* and, in 1899, editor of the *Jewish Year Book*. In 1905 he became assistant secretary of the Smithsonian Institution and, in 1908, president of Dropsie College for Hebrew and Cognate Learning. Among his publications are *The Shofar, Its Use and Origin* (1893); *Told in the Coffee House* (with Allan Ramsay, 1898), a series of folk tales collected in Constantinople; *International Catalogue of Scientific Literature* (1905); *Jews in the Diplomatic Correspondence of the United States* (1906).

ADLER, FELIX (1851—). A German-American educator and reformer. He was born Aug. 13, 1851, at Alzey, Germany, and came in 1857 to the United States, where his father had been called to the ministry of Temple Emanu-El at New York. After graduating at Columbia College in 1870, he studied philosophy and economics at the universities of Berlin and Heidelberg, receiving the degree of Ph.D. in 1873. On his return to New York he was appointed professor of Hebrew and Oriental literature at

Cornell University and held this position from 1874 to 1876, when he organized in New York the Society for Ethical Culture (q.v.), with which his name has since been identified. He became widely known as a lecturer and writer, serving as an editor of the *International Journal of Ethics*. In 1902 Dr. Adler was called to the chair of social and political ethics created especially for him in Columbia University. He was also Roosevelt professor at the University of Berlin for the year 1908-09. He took a conspicuous part in the agitation against child labor and other evils. His principal literary works are *Creed and Deed* (New York, 1877); *The Moral Instruction of Children* (New York, 1898); *Marriage and Divorce* (1905); *Life and Destiny, or Thoughts from the Ethical Lectures of Felix Adler* (1905); *The Religion of Duty* (1905; 2d ed., 1912); with W. H. Maxwell, *What the Ethical Culture School Stands for* (1910).

ADLER, FRIEDRICH (1827-1908). A German architect and art historian. He was born at Berlin; studied at the architectural academy there and later traveled widely. He was appointed professor in the Berlin Academy in 1863, and from 1877 until his retirement in 1903, he was consulting architect to the Prussian Minister of Public Works. He designed several church structures, including Christ Church and St. Thomas's at Berlin, St. Paul's at Bromberg, and the Church of the Redeemer at Jerusalem (1898). He made an extensive study of the architecture of ancient times and of the Middle Ages, and took an active part in the excavations at Olympia. Besides contributions to official reports, he published *Mittelalterliche Backsteinbauwerke des preussischen Staats* (1858-98); *Die Baugeschichte von Berlin* (1861); *Baugeschichtliche Forschungen in Deutschland* (1870-79); *Das Mausoleum zu Halikarnass* (1900); *Zur Kunstgeschichte* (1906).

ADLER, GEORG (1863-1908). A German economist and author, born at Posen. He lectured as extraordinary professor of sociology at the University of Basel, Switzerland, and afterward became professor of political economy in the University of Freiburg, Germany. In 1900 he was made professor of political science in Kiel University. His writings on economic and sociological questions, in which he usually advocates moderation as opposed to revolutionary agitation, include *Karl Marx'sche Kritik* (1886); *Internationaler Arbeiterschutz* (1888); *Social-Reform und Theater* (1891); *Staat und Arbeitslosigkeit* (1894); *Die Social-Reform im Altertum* (1898); *Geschichte des Socialismus und Communismus* (1900); *Ueber die Epochen der deutschen Handwerkerpolitik* (1903); *Die Bedeutung der Illusionen für Politik und sociales Leben* (1904); *Stirners Anarchist* (1907); *Hauptwerke des Sozialismus und der Sozialpolitik* (1908-09).

ADLER, GEORGE J. (1821-68). A German-American philologist. He was born in Germany, and at the age of 12 came to New York. He graduated at the University of New York in 1844 and in 1846 was appointed professor of German in that institution, which position he held until 1854. His last years were clouded with insanity. He published *German-English Dictionary* (1848; frequently reprinted); *German Grammar* (1868); *Wilhelm von Humboldt's Linguistic Studies* (1868), and a translation of Fauriel's *History of Provençal Poetry* (1860).

ADLER, GUIDO (1855—). An Austrian

writer on music. He was born at Eibenschütz (Moravia) and attended the gymnasium at Vienna, where he conducted a chorus of the pupils. At the same time he received his musical education at the conservatory (under Bruckner and Dessoff). In 1880 he received the degree of Ph.D., his dissertation being *Die historischen Grundklassen der christlich-abend-ländischen Musik bis 1600*. From 1881 to 1885 he was lecturer on the science of music at the University of Vienna. In 1885 he became professor of music at the German University of Prague. After the retirement of Hanslick (q.v.) he returned in 1898 to the University of Vienna as professor of the history and theory of music. Together with Chrysander (q.v.) and Spitta (q.v.) he founded in 1884 the important *Vierteljahrsschrift für Musikwissenschaft*, to which he subsequently contributed many valuable articles dealing with the history and the theory of music. In 1884 he began the monumental publication *Denkmäler der Tonkunst in Oesterreich*, published by Artaria in Vienna and Breitkopf and Härtel in Leipzig, which is subsidized by the Austrian government. Up to 1913, 19 double volumes appeared containing works of the old Austrian composers and such masters as spent the greater part of their life in Austria. Many of the historical introductions were written by Adler himself. During the International Exhibition at Vienna in 1892 he acted as chairman of the historical section. His essays, dealing chiefly with the history of music and embodying the result of original research, were published in various musical periodicals. An important contribution to the æsthetics of music is his book *Der Stil in der Musik* (1911).

ADLER, HERMANN (1839–1911). Chief rabbi of the United Hebrew Congregations of the British Empire. He was born at Hanover, Germany, and was educated at London, Prague, and Leipzig, receiving the degree of Ph.D. in 1862. In 1863 he was appointed principal of the Jews' College, London, where, notwithstanding his appointment as minister of the Bayswater Synagogue in 1864, he remained as tutor of theology until 1879, and upon his unanimous election as chief rabbi of the United Hebrew Congregations of the British Empire in 1891 he became president of the college. Afterward he became minister of the Cathedral Synagogue in Duke's Place. He wrote many essays, such as *Ibn Gabirol, the Poet Philosopher, and his Relations to Scholastic Philosophy* (1864); *Can Jews Be Patriots?* (a reply to Goldwin Smith, *Nineteenth Century*, 1878); *Anglo-Jewish Memories, and Other Sermons* (1909).

ADLER, NATHAN MARCUS (1803–90). Chief rabbi of the United Hebrew Congregations of the British Empire. He was born in Hanover and educated at the universities of Göttingen, Erlangen, and Würzburg. He was appointed chief rabbi of Oldenburg (1830), of Hanover and the provinces a year later, and, in 1845, chief rabbi of the British Empire. He was one of the organizers of Jewish schools in London and the provinces; he joined Sir Moses Montefiore in his appeal for the Holy Land, by which £20,000 was raised; was one of the founders of the "United Synagogue," and was founder and first president of the Jews' College, London. He published several important Hebrew works, among them *Netinah la-Ger* (1875), a commentary on the Targum of Onkelos, besides volumes

of sermons, including *Sermons on the Jewish Faith*.

ADLER, SAMUEL (1809–91). A German-American rabbi and author, born at Worms, Germany. He studied at the universities of Bonn and Giessen, was rabbi of congregations in Alzey and vicinity (1842–56), and rabbi of the congregation Emanu-El of New York City (1857–74). He was a learned Talmudic scholar and an earnest progressionist. His works include *Jewish Conference Papers* (1880); *Benedictions* (1882); and *Kobez 'al Yad (Collections, 1886)*.

ADLER, VICTOR (1852—). An Austrian Socialist leader, born at Prague, and educated in the Vienna University. After visiting England, he wrote a book on factory inspection there. He founded at Vienna a Social Democratic weekly journal, which was suppressed by the government. Afterward he founded and became editor-in-chief of the *Arbeiter Zeitung*. He was a member of the lower Austrian diet, and in 1907 of the Imperial Council. His publications include *Die Arbeiter Kammern und die Arbeiter* (1886).

ADLERBERG, äd'lër-bërk, VLADIMIR FIODOVICH, COUNT (1790–1884). A Russian statesman, born in St. Petersburg. In 1817 he was Adjutant to the Grand Duke Nicholas, and later, for his devotion during the Decembrist revolution in 1825, became Major-General, accompanying the Emperor during the Turkish campaign in 1828. He soon became Director of the War Department and in 1841 was made Postmaster-General, distinguishing himself by many reforms in the postal service. He was made General of Infantry in 1843, Count in 1847, and in 1852 Minister of the Imperial Household, in constant attendance on the Emperor, and kept the position under Alexander II, retiring in 1872.

ADLERCREUTZ, äd'lër-kroits, KARL JOHAN, COUNT (1757–1815). A Swedish general and statesman, born in Finland. He was defeated in Finland by the Russians in 1808, and his estates were confiscated. With Georg Adlersparre he brought about the overthrow of Gustavus IV, who was succeeded on the Swedish throne by Charles XIII. Later the two generals quarreled, and Adlersparre was disgraced, while Adlercreutz remained in favor.

ADLERSPARRE, äd'lërs-pä're, GEORG, COUNT (1760–1835). A Swedish general and statesman; educated at the University of Upsala; entered the army, took part in the war against Russia in 1788 and in the campaigns against Norway. After the death of Gustavus III he devoted himself to the study of political economy. He reëntered military service in 1808 and fought against Russia; and the next year joined with Adlercreutz in the movement to elevate Charles XIII to the Swedish throne. In 1810, finding himself succeeded in the new King's favor by his rival Adlercreutz (q.v.), he withdrew from court. In 1831 he was fined for publishing secret state papers, including his correspondence with Charles XIII.

AD LIBITUM (Lat. at will, It. *a piacere, a piacimento*). In music, a term indicating that the part, accompaniment, embellishment, or instrument may be omitted at will. Thus, a song written with 'cello accompaniment *ad libitum* may be sung to the piano accompaniment alone or with the 'cello added. The term also denotes liberty in tempo and rhythm. See ACCOMPANIMENT.

ADMEASUREMENT. See MEASUREMENT OF SHIPS.

ADMEASUREMENT OF DOWER (Lat. *ad, to + measurement*). In English law, an ancient writ by which an heir could obtain redress against the widow of his ancestor in case the heir or his guardian had, during the heir's minority, assigned to her more land as her dower than she was entitled to. The writ has been superseded by simpler forms of action; but the remedy, often under the same title, still remains wherever the common law principle of dower (q.v.) is recognized, as is still generally the case in this country. Consult Scribner, *Treatise on the Law of Dower* (Philadelphia, 1883), and Roper, *Treatise on the Law of Property Arising from the Relation between Husband and Wife* (Philadelphia, 1841).

ADME'TUS (Gk. Ἄδμητος, *Admētos*). A mythical King of Pheræ, in Thessaly. He was in the Calydonian hunt and the Argonautic expedition. By the aid of Apollo, who was his herdsman during a year of banishment from Olympus, he won for his wife Alcestis, daughter of Pelias. Apollo also procured for him a prolongation of life, if another would die in his stead. Alcestis consented, but was sent back from the lower world by Persephone, or, according to Euripides, was rescued by Hercules from death at the tomb itself. The story forms the subject of a celebrated drama by Euripides (q.v.), *Alcestis*. Compare Browning, *Balaustion's Adventure* (London, 1871).

AD'MI. Cuvier's gazelle. See GAZELLE.

ADMIN'ISTRA'TION (Lat. *ad, to + ministrare, to attend, manage*). In general, the management or conduct of any business; especially, in politics, executive government. In its broadest sense, in public affairs, it means the full activity of the government engaged in the practical exercise of its authority in conformity with the constitution of the nation. But, usually, administration refers only to those functions of the government exercised through the executive and, in some cases, through the judicial department, designed to carry into execution the laws enacted by the legislature. The organization of administration may be divided into two kinds, centralized and localized. In France the administration is highly centralized, every official being held to a strict account by those of a higher order. In the United States the national administration is centralized; state administration is, in general, decentralized, or localized. In the case of most of the States not all, if any, of the chief executive officers are subject to the control of the governor; the execution of State laws is often left to local elective officials who are not subject to central control. Current tendencies in the States are, however, in the direction of centralization. In a broader sense the administration includes the whole executive organization of government.

In American national politics the administration, in its narrower sense, signifies the president and his cabinet; in State and local politics, the governor and his chief executive officials, or the mayor and his department heads. This is the sense in which the term is used in England and on the Continent. In England the administration, represented by the premier and his cabinet, is always composed of members of the party having the legislative majority. See GOVERNMENT; MUNICIPAL GOVERNMENT; CIVIL SERVICE; also *Government* under UNITED STATES, FRANCE, GERMANY, ETC. Consult Goodnow, *Principles of the Administrative Law of the United*

States (New York, 1905); id., *Comparative Administrative Law* (New York, 1893); Fairlie, *The National Administration of the United States* (1905); Freund, *Cases on Administrative Law* (St. Paul, 1911).

Administration, in Law. A term applied to the management and disposal of a deceased person's estate. It includes payment of debts, getting in of credits and choses in action belonging to the deceased person, and the distribution of his personal estate to his legatees or next of kin. Anciently, the king as *parens patrii* administered decedent's estate through his officers. By the statute of Westminster II this duty was delegated to the ordinary, and by later statute he was directed to grant administration to the husband or wife or next of kin of the decedent. To-day the jurisdiction over decedents' estates is committed in England to the Court of Probate, and in the United States to courts variously known as probate courts, surrogates' courts, and orphans' courts. The officer of administration, if appointed by will, is called an executor; if not nominated by will and appointed by the court having jurisdiction over decedent's estates, he is called an administrator. An administrator may be *temporary*, when he is appointed pending litigation upon the question as to who is entitled to administer upon the estate; or *with the will annexed*, when the will failed to name an executor, or the executor named fails to qualify for his office; or *de bonis non*, that is, to administer upon the goods not administered by a prior administrator, who no longer retains his office because of death or removal. Administration may also be ancillary, in which case the officer of the administration is said to be an ancillary executor or administrator. The distinction is a consequence of the rule that the place of administration is the domicile of the decedent, and that the administrative officer has no authority outside the jurisdiction where he is appointed or confirmed. Thus, when a decedent leaves property in two jurisdictions, his estate should be administered in the jurisdiction of his domicile, and the administrative officer, in order to act in the other jurisdiction, should obtain an appointment ancillary to his appointment in the domiciliary jurisdiction. It is then his duty to transmit the assets to the jurisdiction of domicile, to be there administered. By the canon law the administrator or executor becomes vested with title to the decedent's personal property. This is still the rule by statute in most jurisdictions. In addition to the duties already referred to, special duties might be imposed upon an executor by the will. In most jurisdictions the administrator, and in some the executor, is required to give a bond for the faithful performance of his duties. He remains bound on his obligation, and subject to the direction of the court, until his final accounting and discharge by order of the court. See Schouler, *Treatise on the Law of Executors and Administrators* (3d ed., Boston, 1901); Woerner, *Treatise on the American Law of Administration* (2d ed., Boston, 1899); Williams, *Treatise on the Law of Legal Representatives* (London, 1899); Woerner and Wizenous, *Law of Decedents' Estates Including Wills* (Boston, 1913).

ADMINISTRATION, MILITARY. A form of government which takes the place of the civil governing powers in regions placed under martial law. The city of Paris, during the war with

Germany, 1870-71, and Cape Colony, South Africa, during the recent Boer War, are cases in point. The term "military administration" is also used to designate the system which regulates the government of the military establishment both in peace and war. See **MARTIAL LAW**.

ADMINISTRATION OF ESTATES. The settlement of the estate of a decedent or a bankrupt. Administration of the estates of deceased persons was formerly in England committed to the ecclesiastical courts, acting through an administrator, appointed by the court, or an executor designated by the last will and testament of the deceased. It is now under the jurisdiction of the Divorce, Probate, and Admiralty Division of the High Court of Justice. In the United States it is usually the function of special tribunals, known variously as probate or surrogate's courts, but is often committed to the ordinary tribunals, as county courts. For the principles governing the administration of decedents' estates, see **EXECUTOR AND ADMINISTRATOR**. The administration of the estates of bankrupts is committed to a trustee in bankruptcy. See **BANKRUPTCY**.

ADMINISTRATIVE LAW. That part of the law which regulates the enforcement of the will of the State as expressed by the authorities which are permitted by the governmental system to express that will, particularly the legislature. Since it is necessary under all governmental systems that authorities be formed for the purpose of enforcing the law, administrative law treats, in the first place, of the organization of the administrative authorities, both those having jurisdiction over the entire State (who are known as central administrative authorities), and those having jurisdiction over only a portion of the State, who are known as local authorities. In the United States, e.g., the administrative law treats: of the President; the heads of the Federal executive departments and their subordinates (both at Washington and in the districts into which the country is divided for purposes of Federal administration, such as the customs and internal revenue districts); or the State governor and State officers generally; or the county, town, and city officers. Since no administrative officer may legally take any action which he is not authorized by the law to take, the administrative law treats, in the second place, of the powers and duties of administrative officers; in other words, of administrative functions. Finally, since there is no use in delimiting by law the powers and duties of administrative officers, unless some means is provided of preventing them from exceeding their powers and forcing them to perform their duties, administrative law treats of the remedies afforded in case of an excess of power or violation of duty. American administrative law thus embraces certain well-defined minor branches of the American law, such as the law of officers, the law of municipal corporations, the law of taxation, the law of public nuisances (whether common law or statutory), the law of extraordinary legal remedies (such as mandamus, prohibition, certiorari, quo warranto, and habeas corpus), as well as the law of equitable remedies, so far as they are applicable to public authorities.

Bibliography. Goodnow, *Comparative Administrative Law* (2 vols., New York, 1893) and *Administrative Law of the United States* (New York, 1905); Mechem, *Law of Offices and Officers* (New York, 1890); Dillon, *Law of Muni-*

cipal Corporations (Boston, 1881); High, *Extraordinary Legal Remedies* (Chicago, 1884).

ADMIRABLE CRICHTON, kri'ton. See **CRICHTON, JAMES**.

ADMIRABLE DOCTOR. A translation of the Latin, *Doctor Admirabilis*, a title given to Friar Roger Bacon (1214-94) on account of his extensive knowledge.

ADMIRAL. The title of a naval officer of the highest rank. The word is derived from the Arabic *amir*, or *amir al-* ('lord,' or 'chief of the'), forming the first part of many compound words, such as *amir al-mu'minin*, 'commander of the faithful'; *amir al-umarā*, 'commander of the forces'; *amir al-bahr*, 'commander of the sea'; *amir al-umarā 'asākir*, 'commander of the troops, marshal.' The term appears to have been introduced into Europe during the Crusades and to have been first used in a definite sense by the Sicilians and afterwards by the Genoese. In French the word is preserved without change, as *amiral*; in Spanish and Portuguese it has developed into *almirante*, and in Italian into *ammiraglio*. The early English form was doubtless similar to that of the French, as we find it spelled *amyrell* and *admyrall*. It was Latinized in England as *admiralius*, and as early as the time of Edward III was Anglicized as *admyrall*. The first English "admiral of the seas" of whom there is any record was William de Leybourne, 1297. His office, however, was not that of a commander of sea forces, but embraced those general and extensive powers afterwards associated with the title of lord high admiral of England; that is, both the administrative functions now vested in the lords commissioners of the admiralty (five in number) and the judicial authority belonging to the present high court of admiralty. The office of lord high admiral was last filled by the Duke of Clarence, afterward William IV. Upon his resignation in 1828 it was put in commission, reverting to a previous practice. The duties of the office were administered by a board of commissioners from 1632 to about 1650, from 1685 to 1702, and from 1708 to 1827, while under the Commonwealth they were performed by a committee of Parliament.

In the United States navy the grades of admiral, vice-admiral, and rear-admiral were established by act of Congress, primarily for the purpose of conferring exceptional distinction upon the great naval commander Capt. David Glasgow Farragut (q.v.). The lowest of these grades, that of rear-admiral, was established in 1862, as was also that of commodore; though the latter had previously existed as a courtesy title without authority of law. The number of rear-admirals on the active list was limited to nine. In 1864 the President was authorized to appoint one of the rear-admirals a vice-admiral. Under the laws, Captain Farragut became the first commodore, first rear-admiral, and first vice-admiral. In 1866 Congress provided for an active list of one admiral, one vice-admiral, and 10 rear-admirals. Farragut was promoted to be admiral, and Rear-Admiral David D. Porter to be vice-admiral. On the death of Farragut (1870), Porter became admiral and Rear-Admiral Stephen Clegg Rowan was promoted to be vice-admiral. With the death of Porter (1891) and Rowan (1890), the grades of admiral and vice-admiral became extinct. In 1899 the grade of admiral of the navy was established by act of Congress. This is a grade above admiral and corresponds to "admiral of the fleet" in the

British navy and a similar one in other naval services. Rear-Admiral George Dewey was promoted to this grade in recognition of his services in the battle of Manila Bay and of his judicious management of the difficult international situation following the defeat and destruction of the Spanish fleet. In 1882 Congress reduced the number of rear-admirals on the active list to six and the number of commodores to 10; but in 1899 the number of rear-admirals was increased to 18 and the grade of commodore on the active list abolished. In addition, the chiefs of the bureaus of the Navy Department have the rank of rear-admiral during their term of office. Under the original act of Congress (Nov. 15, 1776), looking to the establishment of the ranks of admiral, vice-admiral, and rear-admiral, the first named ranked with the general of the army, the second with a lieutenant-general, and the last with a major-general. Since 1862 various acts have confirmed these provisions; but the act of 1899, which abolished the rank of commodore, provided that the first nine rear-admirals should rank with major-generals and the second nine with brigadier-generals. The pay of flag officers is as follows: admiral of the navy and admiral, \$13,500; senior nine rear-admirals, \$8000; junior nine rear-admirals, \$6000. All officers on sea duty or on shore duty beyond seas receive 10 per cent in addition to foregoing amounts. The pay of officers on the retired list is 75 per cent of their active pay at time of retirement. The number in 1913 on this list was 145. The flag of the admiral is a rectangular blue flag with four white stars and is flown at the main; that of the vice-admiral, flown at the fore, is a similar flag, with three stars. The flag of a rear-admiral, flown at the mizzen, is similar in shape, has two stars, and is usually blue in color, but in case two or more rear-admirals are in company the senior flies a blue flag, the juniors fly red flags. For illustration see Plate of United States Flags accompanying FLAG.

In the British navy the admirals are distinguished into four classes: admirals of the fleet, admirals, vice-admirals, and rear-admirals. In former times each grade was sub-divided into three sections, known as admirals (or vice or rear-admirals) of the red, of the white, and of the blue, respectively. The flag hoisted by the admiral (thence called a flag officer) agreed in color with his section; and all the ships under his command carried ensign and pennant of the same hue; but the distinction was otherwise without practical effect and is now abolished. Admiral of the fleet is a higher rank, conferred at the will of the sovereign. The rates of full or sea pay of flag officers are as follows: admiral of the fleet, per day, £6; admiral, £5; vice-admiral, £4; rear-admiral, £3. An admiral commanding-in-chief receives £3 a day additional at home and £4 10s. abroad, as table money. In 1913 there were 92 flag officers on the active list in the British navy: viz., 3 admirals of the fleet, 12 admirals, 22 vice-admirals, and 55 rear-admirals; and on retired and reserved pay, 6 admirals of the fleet, 99 admirals, 13 vice-admirals, and 18 rear-admirals. The admiral of the fleet takes rank with a field marshal, admirals with generals, vice-admirals with lieutenant-generals, and rear-admirals with major-generals.

ADMIRAL. 1. In entomology, any of several nymphalid butterflies, ordinarily the "red" admiral (*Pyrameis* or *Vanessa atalanta*), com-

mon throughout North America, Europe, northern Asia, and Africa. It has an expanse of about 2½ inches and is brown, the hinder wings broadly margined with red, including a row of four dark dots; the same color forms a curved diagonal band across the fore wings, beyond which the angle of the wing is spotted with white and edged with purple. (See Plate of AMERICAN BUTTERFLIES.) The caterpillar is 1½ inches long, brown and spinous; the chrysalis is brown, naked, and suspended to the food-plant upon which the larva has fed, usually some species of nettle, hop, or related plant. Butterflies of the related genus *Basilarchia* are called white admirals. 2. In conchology, a cone (*Conus ammiralis*) whose shell was formerly rare and valuable.

ADMIRALTY, THE. In England, the state department which exercises the administrative functions of the lord high admiral, and which, accordingly, has the management of all matters concerning the British navy and the royal marine. These functions of the lord high admiral have been transferred to and vested in a board of commissioners. (See ADMIRAL.)

The board of admiralty, as at present constituted, comprises five lords commissioners of the admiralty, who decide collectively on all important questions. Besides this collective or corporate action, each commissioner has special duties assigned to him. There are two civil or political lords, and three naval or sea lords. The first lord, who is always a cabinet minister, besides a general control, has the management of naval estimates, finance, political affairs, slave-trade prevention, appointments, and promotions. The first naval lord manages the composition and distribution of the fleet, naval discipline, appointment of inferior officers, commissioning ships, general instructions, sailing orders, and the naval reserve. The second naval lord attends to armaments, manning the navy, the coast-guard, the marines, marine artillery, and naval apprentices. The third naval lord has control over the purchase and disposal of stores, victualing ships, navy medical affairs, transports, convicts, and pensioners. The junior civil lord attends to accounts, mail-packets, Greenwich hospital, naval chaplains, and schools. Naval architecture, the building and repairing of ships, steam machinery, and new inventions are superintended by the comptroller of the navy, who is not a member of the board, but is directly responsible to the first lord. Under the lords are the first secretary (parliamentary), the second secretary (permanent), and the naval secretary (professional), who manage the daily office work. The lords all resign when the prime minister resigns, and those who have seats in Parliament are replaced by others.

ADMIRALTY INLET. The central and main passage of Puget Sound (q.v.), forming in its southern part the eastern branch of the arm of the sea which here penetrates the State of Washington. The width varies from one to 10 miles, and the channel is obstructed by relatively few islands. The coast line is marked by a succession of projecting points of land and receding minor inlets, which render the form as a whole exceedingly irregular. Seattle, Tacoma, and Port Townsend are the chief cities on the Inlet. The channel has usually a depth of several hundred feet and thus offers valuable facilities for transportation.

ADMIRALTY ISLAND, íland (Map: Alaska, J. 4). An island about 80 miles long well wooded and watered, included in Alaska (q.v.).

ADMIRALTY ISLANDS. A group of about 40 islands, constituting a part of the Bismarck Archipelago (q.v.), lying to the north-east of New Guinea, between 2° and 3° S. lat. and 146° 18' and 147° 46' E. long. (Map: East India Islands, L 5). The largest is about 60 miles long from east to west and is covered with rich tropical vegetation. They abound in cocoanut and rubber trees and are inhabited by savages. They were discovered by the Dutch in 1616 and became a German protectorate in 1885.

ADMIRALTY LAW. The system of law and procedure relating to maritime transactions. It owes its name to the fact that originally it was administered in England by the lord high admiral. Not only its rules of substantive law but its procedure were adopted from the civil law and from such sea codes as those of Rhodes (q.v.) and Oléron (q.v.). This fact, and its adaptability to new causes of action, which led suitors to resort to the admiralty rather than to the common law courts, aroused the hostility of the common law bench and bar. The contest between the partisans of the two systems which followed resulted in contracting the jurisdiction of English admiralty courts to very narrow limits. Modern statutes have extended it, and have also made the Court of Admiralty a part of the High Court of Justice, forming it, with the courts of probate and divorce, into the Probate, Divorce, and Admiralty Division. At present the ordinary jurisdiction of English admiralty courts embraces actions to recover possession of a ship, to recover damages for injuries to shipping, to recover seamen's wages, for salvage, for necessaries supplied to a ship, for bottomry, respondentia, and mortgage, for pilotage and towage, for restoration of goods taken by pirates, and for assaults or batteries on the high seas.

By the United States Constitution (Article III, §2), the cognizance of "all cases of admiralty and maritime jurisdiction" is granted to the Federal judiciary. The limits of this grant of judicial authority were in doubt for many years. On the one hand it was insisted that the admiralty jurisdiction of the Federal courts was confined to the cases cognizable by the English admiralty when our States separated from the mother country. On the other hand, it was argued that the broad language of the Constitution extended this jurisdiction to all cases of maritime law. The latter view has prevailed, and to-day the Federal courts of admiralty have cognizance of all maritime cases arising, not only on the high seas and great lakes, but on almost all navigable rivers and canals within the United States. While the United States have no court whose duties and jurisdiction are confined to admiralty cases, the district courts possess exclusive original jurisdiction over all admiralty and maritime cases. From their final decisions appeals may be taken to the Circuit Court of Appeals and to the Supreme Court. The Federal courts sitting in admiralty have criminal as well as civil jurisdiction; but their practice in criminal cases is similar to that of common law courts, including trial by jury. The State courts of

this country have no admiralty jurisdiction. Consult: Benedict, *The American Admiralty, Its Jurisdiction and Practice* (Albany, 1900); and Roscoe, *Treatise on the Jurisdiction and Practice of the Admiralty Division of the High Court of Justice* (London, 1882).

ADMIRALTY SOUND. A southern extension of the Strait of Magellan near its middle part, penetrating Tierra del Fuego to a distance of nearly 100 miles. Its mouth is partially blocked by Dawson Island. In the upper 50 miles of its extent its width varies from 5 to 10 miles. The coast land is elevated.

ADMIS'SION. In the law of evidence, a confession or acknowledgment of a party to an action, made at any time, as to the existence of a fact in issue. An admission is valid evidence against the party making it at the trial of the action, but, on the other hand, is never permitted to operate in his favor. While admissions admissible in evidence are most frequently made by a party to the action, they may be made by one acting by his authority or by one identical in interest with him. Thus, admissions made by an agent, or servant, or by the husband or wife of a party, will be received in evidence against him if actually or impliedly authorized by him. Admissions made by one claiming under the same title or interest as the party are also admissible in evidence against him. For example, admissions made by a deceased person during his lifetime are admissible against his executor or administrator, and admissions made by the owner of real estate with reference to his title are competent evidence against his grantee, when the grantee is a party to an action in which his title is in issue. In England and the United States, excepting New York and the Federal courts, the doctrine of admissions made with reference to title to real property has been extended to apply to cases of admissions made with reference to title of personal property and negotiable paper transferred after maturity.

In criminal law admissions of guilt by one accused of a crime are technically known as *confessions*. At common law, confessions were held not to be competent evidence against the prisoner when obtained by threats or promise of favor, and modern statutes have generally still further limited the admissibility of confessions in criminal cases.

Admission should be distinguished from *admission against interest*, a term which embraces a distinct class of evidence. Admissions against interest are statements or book entries made by one against his financial or proprietary interest, and are admissible in evidence in any action in which the truth of the matter stated in the admissions is in issue, provided the person making the admission be dead at the time it is offered in evidence. The person making the statement need not represent or be in privity with a party to the action or have acted by his authority. See the works referred to under EVIDENCE.

ADMONI'TIONISTS. A name applied to the partisans of *An Admonition to the Parliament*, published in 1572 by two Puritan clergymen, and of the *Second Admonition to the Parliament*, by Thomas Cartwright (q.v.), the leader of the sect.

ADOBE, á-dō'bě (Spanish). A Spanish-American name applied to sun-dried bricks made from any suitable material which becomes

hardened on exposure to the sun. Such bricks, employed largely in the arid and semi-arid districts of North America, are usually made in two sizes, the approximate dimensions of which are 18 by 9 by 4 inches, and 16 by 12 by 4 inches. Those of the latter size when laid alone are used as "headers," i.e., with the greatest dimension crosswise to the length of the wall, though a much stronger wall results from a combination of the larger size as headers, with the smaller as "stretchers," or lengthwise to the direction of the wall. The process of baking consists in first exposing the newly moulded adobes to the direct rays of the sun for a day, then turning them for exposure of the under face and continuing the exposure for from seven to fourteen days, eventually stacking the finished product under cover till required for use. Because of the lack of coherency, adobes can be employed only in regions of limited rainfall. Many of the bricks made in ancient Egypt, Assyria, and Babylonia were made of clay mixed with straw and baked in the sun.

Adobe Soil. A term applied to certain clay soils in the western portions of the United States, which, when moist, are of exceeding plasticity, and when dry are of such coherency as to prohibit easy tillage. They are composed of quartz, clay, and other minerals in extreme state of fineness. These soils may be rendered more docile by plowing into the moist clay considerable quantities of sand loam. They cover thousands of square miles in the arid region of the West, principally in the States of Utah, Nevada, Colorado, New Mexico, Arizona, Texas, and California. Under irrigation they show astonishing fertility, yielding undiminished harvests of grains, alfalfa, and other crops year after year. The origin of adobe soils has been something of a puzzle, but it is likely they are of complex derivation, formed in some places by streams that head in the mountains and in other sections by accumulation of wind-blown materials. They may also have been formed by the disintegration in place of clay shales or slates.

ADOLESCENCE. The period of life extending from puberty (q.v.) to the age of 21 in females and 25 in males. It is marked by active growth, especially in the osseous and muscular systems, and certain vascular tissues. The reproductive organs reach their full maturity during the latter part of the period, at which time there is a partial cessation of the exaggerated nutritive activity prevailing throughout the earlier part. During adolescence the mind becomes conscious of new capabilities; self-assurance and constructive and originating tendencies become apparent. In the boy, extravagant plans, conceit, and egoism are prominent characteristics; in the girl idealizing, reverie, and romantic imagination. It is apparent that the sexual and mental development occurring during this period render proper training and influence during adolescence of the utmost importance. Consult: G. Stanley Hall, *Adolescence* (2 vols., New York, 1907); *Youth: its Educational Requirements and Hygiene*, by the same author (New York, 1912); and for the sexual aspects, Havelock Ellis, *Psychology of Sex* (Philadelphia, 1910).

ADOLF, ä'dölf. King of Germany. See ADOLPHUS.

ADOLF I (?-1220). Archbishop of Cologne from 1194 to 1205. He was one of the foremost opponents of the Hohenstaufen dynasty, and, despite his oath of fealty to Frederick II, and in defiance of the will of the majority, he nominated Otto IV of Brunswick and crowned him at Aix-la-Chapelle, June 9, 1198. He forestalled the papal influence upon the imperial election, and when finally Otto revealed his inability to protect his adherents against Philip of Swabia, Adolphe crowned his opponent (1205). He was excommunicated, and deposed in 1205.

ADOLF I (1353-90). Archbishop of Mainz. In 1371 he was appointed Bishop of Speyer and two years later, after the death of his rival, John, succeeded to the see of Mainz. When, at the instigation of Charles IV and with the consent of the Pope the Landgrave of Thuringia sought to bring about his deposition, Adolph firmly maintained his ground and upon the outbreak of a schism in the Church obtained the papal sanction of Clement VII (Antipope) and Urban VI.

ADOLF, WILHELM AUGUST KARL FRIEDRICH (1817-1905). Grand Duke of Luxemburg, previously Duke of Nassau, the eldest son of Duke William of Nassau by his first wife, Princess Louise of Saxe-Hildburghausen. He succeeded his father, as Duke of Nassau, Aug. 20, 1839. His anti-progressive policy led in 1848 to a revolt which, however, was speedily suppressed. In the first Schleswig-Holstein War he commanded a brigade of German troops. In the war of 1866 he sided with Austria and as a result was deprived of his territory. During the illness of King William III of the Netherlands, Adolf, as next of kin, succeeded as Grand Duke of Luxemburg, the ruler of which he became upon the death of William III (Nov. 23, 1890). He died Nov. 17, 1905, and was succeeded by his son Wilhelm Alexander (born 1852).

ADOLPHE, ä'dölf'. An important novel by Benjamin Constant de Rebecque, published in 1816. In the hero, Adolphe, is found a realistic presentation of the author's sentimental experience with Madame de Staël.

ADOLPHUS, or **ADOLPH**, OF NASSAU (c.1255-98). King of Germany. He was the son of Walram, Count of Nassau. He was elected to succeed Rudolph of Hapsburg, and was crowned King of the Romans (June 24, 1292). Adolphus agreed to assist England in her war with France for a large subsidy, but failed to fulfil his agreement. For certain high-handed acts he was summoned before the college of electoral princes. He refused to appear, and was formally deposed in May, 1298, the crown being transferred to Rudolph's son, Albert. Adolphus took the field and was killed in the first battle. Consult: Preger, *Albrecht von Oesterreich und Adolf von Nassau* (Leipzig, 1869); Roth, *Geschichte der römischen Königs Adolf I* (Wiesbaden, 1879); Gebhardt, *Handbuch der deutschen Geschichte*, vol. i (Berlin, 1901).

ADOLPHUS, JOHN (1768-1845). An English historian and lawyer, born in London. He was celebrated in criminal practice and gained much credit in the defense of Arthur Thistlewood, charged with treason in the Cato Street conspiracy in London, 1820. His best-known work is the *History of England from the Accession of George III to the Conclusion of Peace, 1783* (7 vols., 1802-45). He also wrote *Bio-*

graphical Memoirs of the French Revolution (1799) and a *History of France* (1803).

ADOLPHUS FRED'ERICK (1710-71). Duke of Holstein-Gottorp and, later, King of Sweden. He was elected successor to the Swedish throne in 1743 and became King in 1751; but, owing to fierce wrangling between "The Hats" and "The Caps," as the political cliques in the Riksdag were known, he found himself but a nominal king. Urged on by his wife, he attempted to better his position and in consequence nearly lost his throne.

ADONAI, ăd'ô-nā'ī or ă-dō'nī (Heb. my lord). A term employed in the Old Testament over 100 times in direct address to the deity. It is often used before Yahwe, forming the expression "my lord Yahwe." When the pronunciation of the sacred name (see JEHOVAH) was forbidden, which was before the third century B.C., Adonai was substituted for it. This was already done in the Greek translation of the Pentateuch, which renders it Kyrios (κύριος): hence the Latin *dominus* and the English "The Lord." See Dalman, *Der Gottesname Adonaj und seine Geschichte* (1889).

AD'ONA'IS. The title of an elegy written by Shelley in 1821 upon the death of the poet Keats, who is therein likened to Adonis in his untimely end.

AD'ONA'I SHO'MO. See COMMUNISTIC SOCIETIES.

ADO'NIA. See ADONIS.

ADO'NI BE'ZEK. See ADONI-ZEDEK.

ADON'IC VERSE. A dactyl and a spondee (— — — | — —), or dactyl and trochee (— — — | — —), adapted to light, lively versification, as in the famous hymn:

"Plaudite cœli;
Rideat æther," etc.

It forms the last verse of the Sapphic and the Adonic stanzas.

ADONIJAH, ăd'ô-nī'jă (Heb. Yahwe is Lord). A son of David and Haggith (1 Kings ii. 21), born at Hebron. After Absalom's death he was the natural heir to the throne and was supported by Joab and Abiathar. He called together his sympathizers at a sacred stone near Jerusalem (1 Kings i. 9), but Benaiah, the captain of the body-guard, Zadok, the priest, and Nathan, the prophet, succeeded, by the aid of Bathsheba, in getting the King's consent to the immediate enthronement of Solomon. Adonijah sought refuge at the horns of the altar. Solomon saved his life, but when he afterward demanded Abishag, David's concubine, for a wife, it was considered a plot for the throne, and Solomon ordered Benaiah to kill him.

ADO'NIS (Gk. Ἄδωνις). A youthful hunter, beloved by Aphrodite, but slain by a boar sent, according to one version, by the jealous Ares, husband of Aphrodite. Aphrodite descended to the lower world and won from Persephone permission for her favorite to return to the light for a time every year. Another and seemingly older myth makes Aphrodite and Persephone quarrel for the possession of the beautiful infant. Zeus finally decided that he should annually spend four months with each of the goddesses and four months as he chose. The legends about Adonis have sprung from the rites of the Adonia, a two-day festival celebrated in midsummer. On one day the loving union of Aphrodite and Adonis was represented, and on the other the sorrow caused by his death. All

the funeral rites were performed by women about little images of Adonis. A special feature was the "gardens of Adonis," potsherds, filled with earth, in which quick-growing plants, such as lettuce and fennel, were sown. After the burial these were thrown into springs. The Adonia was a woman's festival and seems to have been celebrated chiefly by courtesans and others associated in the worship of Aphrodite. It is obviously the worship of a spirit of vegetation, who is believed to have a short life, to die, and then to rise again to renewed life for a season. These rites were widely spread throughout Greek lands; for the rites as celebrated at Alexandria, see the fifteenth Idyll of Theocritus. In Phœnicia they were associated with Thanmuz or Tammuz (q.v.). The theory that the name and worship of Adonis are Semitic is not proved.

ADONIS. A genus of about five species belonging to the family Ranunculaceæ. All of the species are natives of Europe and Asia, but the European *Adonis autumnalis* (sometimes called *Adonis annua*) is cultivated for ornament in the United States and has escaped from cultivation. It is an annual herb, with dissected leaves and showy yellow or red flowers. The orange or red petals with a dark-colored base have suggested the common name "pheasant's eye" or "bird's eye." Its bright scarlet petals have also obtained for it the name of "Adonis-flower," their color having been fancifully ascribed to their being stained with the blood of Adonis. It is a well-known ornament of our gardens, in which also *Adonis œstivalis* frequently appears, and *Adonis vernalis*, a perennial species common upon the lower hills of the middle and south of Germany, with early and beautiful flowers. See Plate, ACANTHUS, ETC.

ADO'NI-ZE'DEK (Heb. Zedek is lord). A King of Jerusalem who opposed resistance to the invasion of southern Palestine by tribes afterward forming a part of the kingdom of Judah. Zedek was a god worshiped in Syria and southern Arabia. The account in Judges i. is more credible than that in Joshua x. Adonibezek is probably a scribal error for Adonizedek. No place called Bezek has been found, and 'Lord of Bezek' would not be a natural name. No god by the name of Bezek is known. On the other hand, Adoni-zedek reminds one strongly of Melchizedek, 'Zedek is king,' another ruler of Jerusalem (Gen. xiv.).

ADOPTIAN CONTROVERSY, THE. An echo of the Arian controversy. It originated toward the end of the eighth century in Spain, the country in which the doctrine of Arius had longest held out. Elipandus, Archbishop of Toledo, and Felix, the learned bishop of Urgel, advanced the opinion that Christ, in respect of his divine nature, was doubtless by nature and generation the Son of God, but that as to his human nature he must be considered as only declared and "adopted" through the divine grace to be the first-born son of God (Rom. viii. 29), just as all holy men are to be adopted as sons of God, although in a less lofty sense. The flame of controversy thus kindled spread into the Frankish Empire, the special domain of "Catholic" Christianity, and gave occasion to two synods—one held at Ratisbon (792), and another at Frankfort (794), in which Charlemagne took part in person and which condemned Adoptianism as heresy. The Catholic doctrine of the unity of the two natures of

Christ in one divine person and the consequent impossibility of there being a twofold Son—an original and an adopted—was upheld by Alcuin and the other learned men of Charlemagne's court. At the synod of Aix-la-Chapelle (799) Felix, yielding to compulsion, recanted his opinions without, as it would seem, being convinced. Elipandus adhered fanatically to his views, which were in after times defended by Folmar (1160), Durandus (died 1334), and the Protestant divine Calixtus (died 1656). Adoptionism was charged against Abelard and also erroneously attributed to Duns Scotus. See Harnack's *History of Dogma* (Eng. trans., New York, 1905).

ADOP'TION (Lat. *adoptio*, a taking or receiving of one in place of a child, from *ad*, to + *optare*, to choose, select). A legal institution of much importance in early society, because of the importance attached to the perpetuation of household worship, particularly the worship of deceased ancestors; also because before the introduction of testaments an heir could, in the absence of natural children, be created only by adoption. In Roman law there were two forms of adoption, viz., *adrogation* and *adoption* in the strict sense. Adrogation was the earlier form. It was possible only where the person to be adopted was an independent person (*sui juris*), i.e., was not under the authority of a father or grandfather. It took place originally in the patrician assembly (*comitia curiata*) with the coöperation of the pontifices. Under the Emperors it was effected by an imperial rescript. Adoption in the strict sense was the transfer of a person from the authority of his father or grandfather into the paternal authority of the adoptive father. It was accomplished by formal acts in the presence of a magistrate. It was usually requisite, alike in adrogation and adoption, that the adoptive father should have no children at the time, and no reasonable prospect of having any. He was also required to be 18 years older than the person adopted. Females could not be adrogated, nor, until the third century, could they adrogate. They could be adopted, but they could not adopt. The effect of adrogation was to place the adopted person in the same legal position for nearly all purposes as a child born in wedlock. The same results originally attached to adoption, but Justinian introduced important restrictions. Adoption was unknown to the law of the Teutonic nations; and though most of the States of the Continent have borrowed it, with some modifications, from the Roman law, it has never existed as an institution in England or Scotland, either at common law or by statute. The theory of the English law is that the parent, as legal guardian, cannot be permitted to abdicate his parental responsibility, though he may by abuse or neglect forfeit it, and in such case the Court of Chancery may transfer the custody of the child to a proper guardian.

Adoption is permitted and regulated by statute in most if not all the States of the American Union. While State legislation upon this topic differs in detail, its characteristic features are as follows: Any inhabitant of the State, of legal age and competent to contract, may adopt a child, provided that the husband or wife of such person, if married, the living parents of the child, and the child, also, if above a certain age (usually 12 or 14 years), consent in writing to the adoption. Only chil-

dren are capable of adoption and in most of the States only minor children. In some States the transaction is consummated by an order of court, in others by a deed duly acknowledged and recorded. As the claims of an adopted child are in derogation of the common law rights of the heirs and next of kin of the adopter, our courts are disposed to put a strict construction on these statutes, and to treat as invalid an adoption which has not been made in a manner which conforms to every statutory requirement. As a rule, the legal relation between adopting parents and adopted children is that of natural parent and child, including the powers of parental control, the duties of filial obedience, and reciprocal property rights by inheritance. In a few States, however, the adopting parent does not inherit from the adopted child. Consult Stimson, *American Statute Law* (Boston, 1886); Schouler, *Treatise on the Law of Domestic Relations* (Boston, 1900); and see PARENT AND CHILD.

AD'ORA'TION. A term originally applied among the Romans to an act of homage or worship performed by raising the hand to the mouth (Lat. *ad os*, whence the word), kissing it, and then waving it toward the object of reverence. It was natural to extend to great men the formal adoration at first paid only to deities, and the Roman Emperors were saluted by bowing or kneeling, touching the imperial robe, and kissing the hand that did so. In eastern countries the form of adoration was to fall on the knees at a prince's feet, strike the forehead on the ground, and kiss the floor. On this analogy both the modern practice of kissing a sovereign's hand and the custom at Rome of kissing the cross embroidered on the Pope's slipper may be said to be forms of adoration. While the term "adoration" is very generally employed nowadays to express a mental attitude toward God, it may be well to remember that both it and the similar term "worship" had a much more limited sense: thus, in the English marriage service the bridegroom says to the bride: "With my body I thee worship and with all my worldly goods I thee endow." Thus, too, as a matter of theological terms, the Roman Catholic church makes a distinction between *latría*, the worship due to God alone, and *dulia*, that given to the angels and saints.

ADORATION OF THE IMMAC'ULATE LAMB, THE. A celebrated altar painting in the cathedral of Ghent, Belgium, by the Flemish artists Hubert and Jan van Eyck. It represents Christ surrounded by the saints, and on the lower panels the sacrifice of the lamb.

ADORATION OF THE MAGI. See MAGI, ADORATION OF THE.

ADORE, ä'dôrf. A manufacturing town of Saxony, 72 miles by rail southwest of Chemnitz (Map: German Empire, E 3). It is situated 1450 feet above sea level in the valley of the Weisse Ester and is at the junction of the Leipzig and Eger railroads. Pop., 1905, 7079.

ADOUR, ä'dôor'. A river of southwestern France, rising near Tourmalet Pass in the department of Hautes-Pyrénées (Map: France, E 8). It flows through the department of Gers and the fertile part of the department of Landes and enters the Atlantic below Bayonne, after a course of 200 miles. It receives several tributaries and is navigable to the extent of 80 miles. Bagnères-de-Bigorre, celebrated for its hot baths, is situated on the Adour.

ADOWA, ä'dō-ä, or **ADUA**, äd'û-ä. The capital of the Abyssinian province of Tigré, situated in lat. 14° 12' N. and long. 39° 3' E. (Map: Africa, H 3). It has an excellent climate on account of its elevated location (nearly 6500 feet) and was, prior to the Italian campaign of 1896, the capital and one of the best-built cities of Abyssinia. During the wars which ended in that year the town was razed several times. Its importance as a commercial centre suffered a decline in consequence, but the development of railway facilities has revived industrial activity. Its population was formerly about 3000, but is probably less now. Adowa was the scene of the defeat of the Italian troops under General Baratieri by the Abyssinians on March 1, 1896. Consult Scetini, "La bataille d'Adoua: Etude tactique," in vol. ix and x, *Journals des Sciences Militaires* (Paris, 1901), and Berkeley, *The Campaign of Adowa and the Rise of Menelik* (London, 1906).

ADRA, ä'drä. A seaport town of Spain, in the province of Granada, 49 miles southeast of Granada. It is situated on the shore of the Mediterranean, at the mouth of the Adra (Map: Spain, D 4). The ancient Abdera, founded by the Phœnicians, was on a hill, at the base of which the modern town stands. The location is unhealthy because of near-by swamps. The port is much exposed to the wind, and the absence of railroads is a great drawback to commercial development. Lead mines in the neighborhood give employment to many of the inhabitants. Among other exports are grapes, wheat, esparto, almonds, wine, and sugar-cane. Spirits, wool fabrics, and sugar are manufactured. Pop., 1900, 11,246.

ADRAIN', ROBERT (1775-1843). An Irish-American mathematician, born at Carrickfergus. During the Irish rebellion of 1798 he was wounded and escaped to America, where he became a teacher of mathematics and occupied chairs at Rutgers (1810-13), Columbia (1813-25), and the University of Pennsylvania (1827-34). He was editor of the *Mathematical Diary* (1825-29) and prepared an edition of Hutton's *Mathematics*. His original work includes papers on the shape and size of the earth and on gravity.

ADRAMMELECH, ä-dräm'e-lëk. 1. A god worshiped by the inhabitants of Sepharvaim after they had been deported to Samaria by Sargon (2 Kings xvii. 24, 31). Sepharvaim is, no doubt, the Babylonian Sippar (q.v.) and not, as has been conjectured, the Sibraim of Ezek. xlvi. 16, a city in northern Syria. The similarity of *r* and *d* in the old script has probably, here as elsewhere, led to the change of Adad and Hadad into Adar and Hadar. Shamash was the chief god of Sippar, but Adad was undoubtedly also worshiped there. (See HADAD.) Adad is frequently connected with Shamash, both being gods giving oracles. Human sacrifices were not offered in Babylonia. The identification of Adad with Melek, who demanded such, may have led the colonists who sought the favor of the gods of the land to resort to such means, or the statement may be due to prejudice on the part of Jewish writers.

2. A son of Sennacherib who, together with his brother Shar-ezer, killed his father, while he was worshiping in the temple of Nisroch, his god, and then fled to Ararat (2 Kings xix. 37). The Babylonian chronicle (*Keilinschriftliche Bibliothek*, ii, 281) mentions only one son. It

is possible that a letter to "Shar-itir-Ashur, king of the world," gives us the throne name of this son, abbreviated in the Hebrew as Sharezer, who held the throne from the 20th Tebet to the 2d Adar, 681, and that Adad-malik, corrupted Adar-malik, was his private name. The murder undoubtedly took place in Babylon, according to a statement of Assur-banipal, and the temple was then the I-zagila of Marduk, the name of this god having been intentionally distorted, as in the case of Abd-nego for Abd-nebo. Consult Winckler, in Schrader's *Die Keilinschriften und das Alte Testament* (Leipzig, 1902).

ADRAR, ä-drär'. An oasis in the western part of Sahara, east of the Spanish possession of Rio de Oro, of which it formerly constituted a part (Map: Africa, C 2). Its area is estimated at about 30,000 square miles, and it contains a considerable portion of fertile land on which grain and dates are grown. Ostriches are raised for their feathers, and salt is mined. Its position on the caravan route of Morocco gives it considerable commercial importance. The inhabitants are mostly Berbers. In accordance with the agreement of 1892 it forms at present a part of French Sahara. The chief town is Wadan, with a population of about 4000.

ADRASTE, ä'drast'. The hero of Molière's comedy *Le Sicilien, ou l'amour peintre*, from whose disguise as an artist comes the sub-title of the piece.

AD'RASTEI'A (Gk. Ἀδράστεια). In Grecian mythology, the Cretan nymph by whom the infant Zeus was cared for in the cave on Mount Dicte, at his mother's request. The name is also applied to Rhea herself and to Nemesis.

ADRAS'TUS (Gk. Ἀδράστος, *Adrastos*). King of Argos, who gave his daughter in marriage to Polynices, son of Œdipus (q.v.) and led the expedition of the "Seven against Thebes" to restore Polynices to the throne. As was predicted by Amphiaraus (q.v.), Adrastus alone escaped alive. A later story makes him die of grief at the death of his son in the war of the Epigoni against Thebes. Adrastus was worshiped at Sicyon, Megara, Athens, Argos, and in the Troad. See EPIGONI; ETEOCLES AND POLYNICES.

ADRE'NALIN. An active principle of the adrenal glands or suprarenal capsules. It is the most powerful hemostatic and astringent known, being from 600 to 1000 times as active as the extracted gland. The substance was simultaneously discovered by Aldrich and Takamine, a Japanese chemist in 1901. It occurs as a light brown finely crystalline powder, having a bitter taste. See SUPRARENAL CAPSULES.

ADRETS, dá'zà'drě', FRANÇOIS DE BEAUMONT, BARON DES (1513-87). A French Protestant soldier, from 1562 prominent for persecuting the Catholics of Dauphiné and Provence. He was born at the Château de la Frette, Dauphiné, early entered the army, and during the wars of the League achieved a reputation for cruelty on the Huguenot side corresponding to that of the Duke of Guise or the notorious Monthic among the Catholics. His acts, however, appear to have been dictated less by religious fanaticism than by predilection for the career of brigand and bravo. Having assumed the style of Lieutenant-General of the King, he organized pillage and murder on a large scale, and, as Martin (*Histoire de France*) testifies,

he left among the simple peasantry a name repeated for centuries as synonymous with destruction. Many interesting tales regarding him are still preserved. Ultimately he accepted the Roman faith. For a detailed account of his doings, consult Beza, *Histoire ecclésiastique des Eglises Réformées* (edited by Baum, Cunitz, and R. Reuss, Paris, 1883-89, 3 vols.).

ADRIA, ä'drê-à (ancient *Adria*, *Atria*, *Hadria*, or *Hatria*). An episcopal city of Italy, province of Rovigo, on the Canal Bianco, 16 miles southwest of Venice in the province of Rovigo (Map: Italy, G 2). It was originally an island and in the time of the Romans was a naval station and a flourishing port. After the fall of the Empire frequent inundations of the Po and the Adige, caused by the bad state of the dikes, brought down alluvial soil and gradually extended the land until Adria attached itself to the continent. It is now 14 miles from the Adriatic and in spite of the canal connecting it with the sea its commercial importance is declining. The ruins of the ancient city that was sacked and burned by the Venetians in the fifteenth century are south of the present city and several meters below the surface. The chief trade is in wine, cattle, grain, silk, linen, leather, and pottery. Pop., 1901, 15,678; 1911, 17,878.

A'DRIAN. A city and county-seat of Lenawee Co., Mich., on the Raisin River, at the intersection of the Wabash, the Lake Shore, the Detroit, Toledo, and Ironton, and the Toledo and Western railroads, 59 miles southwest of Detroit (Map: Michigan, E 7). It was settled in 1825, incorporated as a village in 1828 and as a city in 1853. It is the seat of Adrian College, a Methodist Protestant institution, St. Joseph's Academy (Roman Catholic), and of the State Industrial Home for Girls. Adrian has important industrial interests, including large factories for the manufacture of wire fence, steel posts and castings, pianos and organs, cotton goods, razor strops, condensed milk, electrical appliances, etc. It is governed by a charter, granted in 1861, and revised in 1897, which provides for a mayor, elected annually, and a city council of 12 members. Adrian maintains its public works by city labor under city supervision. Pop., 1890, 8756; 1900, 9654; 1910, 10,763; 1913 (est.), 11,500.

ADRIAN. Roman Emperor. See **HADRIAN**.

ADRIAN. The name of six popes, two of them of considerable interest.—**ADRIAN I**, Pope, 772-795, invited Charlemagne to enter Italy. His letters are in Migne, *Pat. Lat.*, xcvi.—**ADRIAN II**, Pope, 867-872. His letters are in Migne, *Pat. Lat.*, cxxii and cxxix.—**ADRIAN III** (Agapetus), Pope, 884-885. He was the first occupant of the papal chair to change his name on election.—**ADRIAN IV** (Nicholas Brakspere), Pope, 1154-59. He was by birth an Englishman, the only one of that nation who ever sat in the papal chair. His father became a monk in the Benedictine monastery of St. Albans, and so Adrian was in early life thrown on the world. He became first a lay brother or servant in the monastery of St. Rufus, about 50 miles south of Lyons, France, then successively regular monk, prior, and in 1137 was elected abbot. His zeal for strict discipline raised a combination to defame his character, and he had to appear before Eugenius III at Rome. Here he not only cleared himself of all charges, but gained the esteem of the Pope, who appointed him Cardinal-bishop of Albano in 1146 and, later,

delegate to Scandinavia. On the death of Anastasius IV, in 1154, he was raised to the papal see. Adrian had great trouble with the Romans, who disliked his pretensions and were influenced by Arnold of Brescia, whom he caused to be put to death. He was on friendly terms with the Emperor Frederick I, until his high notions of the papal supremacy, which he carried as far as did Gregory VII, led to the beginning of that long contest of the popes against the house of Hohenstaufen which ended in the destruction of the dynasty. He was living away from Rome in practical exile and was about to excommunicate Frederick when he died at Anagni, Sept. 1, 1159. His most remarkable pontifical act was giving, in 1154, Ireland to Henry II, which he claimed he had the right to do because all islands which had been Christianized belonged to the Holy See. Consult S. Malone, *Adrian IV and Ireland* (London, 1899). His letters are in Migne, *Pat. Lat.*, clxxxviii.—**ADRIAN V**, Pope, July 12-Aug. 18, 1276 (Otto buono de' Fieschi), and a cardinal-deacon when elected; he died before he had been consecrated a bishop.—**ADRIAN VI**, Pope, Jan. 9, 1522, to Sept. 14, 1523. His family name was (probably) Dedel, his birthplace Utrecht (1459), his first teachers the Brothers of the Common Life; his professional studies were made at Louvain, and there he became professor of theology. He was appointed tutor to Charles of Hapsburg (the future Emperor Charles V), 1507; was made Bishop of Tortosa, Spain, 1516; cardinal, 1517. Charles made him regent of Spain, 1520, but the Spaniards resented the rule of a foreigner and embittered his life. His troubles did not cease when elected Pope, but he inspired respect by his uprightness. He confessed to serious corruptions in the Church, but died before he could do anything for its reform. Consult the *Lives* by H. Bauer (Heidelberg, 1876) and by A. Lepître (Paris, 1880).

ADRIAN COLLEGE. One of the oldest co-educational institutions in the country, at Adrian, Mich., organized in 1852. The school is under the control of the Methodist Protestant Church. It has property valued at \$250,000, five buildings, including dormitories, and a library of 7000 volumes. The students in 1913 numbered 200 and the faculty 22. Connected with the school are a conservatory of music and a department of fine arts. President, B. W. Anthony, D.D.

A'DRIAN DE CASTEL'LO, or **ADRIANO DI CASTELO**, ä'drê-ä'nô dê kâs-têl'lô (c.1460-c.1521). An Italian scholar and ecclesiastic. He was born in Tuscany and went to England in the reign of Henry VII, who made him his agent at Rome and gave him the bishopric of Hereford (1502), whence he was translated to that of Bath and Wells (1505). He was made cardinal by Pope Alexander VI (1503). In 1517, however, he was implicated in the conspiracy of Cardinals Petrucci, De Sauli, and Riario to poison Leo X and was deprived of his cardinalate and dignities in England (1518). What became of him afterward is uncertain. It is thought that he lived in retirement at Venice and was murdered while on his way to Rome after the death of Leo X in 1521. His writings include *Venatio*, a poem (1505); *De Vera Philosophia* (1507); and *De Sermone Latino et Modo Latine Loquendi* (1513).

A'DRIANO'PLE (Gk. Ἀδριανόπολις, *Hadria-*

nopolis, the city of Hadrian, Turk. *Edirneh*) (Map: Balkan Peninsula, F 4). The capital of the Turkish vilayet of Adrianople, in ancient Thrace. It is situated on the Maritza (the ancient Hebrus), where that river is joined by the Arda and the Tunja, 137 miles by the state railway northwest of Constantinople. Its position at the confluence of three navigable rivers and at the meeting of several routes made it a place of considerable commercial importance, but its economic condition declined after the Russo-Turkish war of 1877-78, and, upon the cession of eastern Rumelia to Bulgaria in 1885 and the consequent adverse tariff, the city lost the greater part of its foreign trade. It was formerly fortified by a strong wall, of which only a few fragments are left. The place is now defended by an extensive circle of forts. In appearance the city is Oriental and for the most part mean and irregular. It has two fine bazaars, a palace, numerous inns, churches, mosques, and schools. The population is about 81,000, about half of whom are Turks and the remainder Bulgarians, Armenians, and Jews. It is the seat of several European consuls. A very ancient town of Thrace, it was rebuilt by the Emperor Hadrian, who gave it his name. It was the scene of an important battle between the Goths and the Romans in 378 A.D., in which the former were victorious and broke through the Roman frontier, effecting a settlement within the limits of the Empire. The city was conquered from the Byzantines by Amurath (Murad) I in 1361, and was the residence of the Turkish sultans from that time until the capture of Constantinople in 1453. The Russian General von Diebitsch occupied Adrianople in 1829. By the treaty signed here on September 14 of that year Russia forced Turkey to relinquish to her the northeastern coast land of the Black Sea and to allow her to establish her sway over the tribes of the Caucasus, to cede to her the district of Akhaltsikh, to accord to her a protectorate over Moldavia and Wallachia, and to recognize the independence of Greece. After the capture of the Turkish army defending the Shipka Pass, in January, 1878, the Russians entered Adrianople unopposed. The occupation of the city was followed by the cessation of hostilities and the conclusion of the Treaty of San Stefano. In the Balkan War of 1912-13 (q.v.) the Turkish garrison valiantly defended the city until forced by starvation to surrender. The city was first attacked Oct. 22, 1912, and within ten days its investment was practically complete, but it did not capitulate until March 26, 1913. By the Treaty of London, signed May 30, 1913, the city and that portion of the vilayet of Adrianople lying west of a line drawn from Enos to Midia were ceded by the Turks to the Balkan allies, but the subsequent outbreak of hostilities among the allies (see BALKAN WAR) obliged Bulgaria to withdraw her garrison from Adrianople and enabled the Turks easily to re-occupy the city on July 20. By the Treaty of Constantinople, Sept. 29, 1913, Bulgaria formally restored to Turkey Adrianople together with the outlying circle of fortifications and sufficient territory to give Turkey control of the railway to Dedeagatch. The vilayet of Adrianople, which, previous to the Balkan War, comprised an area of about 14,822 square miles and a population of about 1,028,200, and extended from the Black Sea and eastern Rumelia to the

Sea of Marmora and the Ægean Sea, was cut in twain by the Treaty of Constantinople, approximately the part west of the Maritza going to Bulgaria and that to the east remaining in Turkish possession.

A'DRIAN'S WALL. See ROMAN WALL.

ADRIATIC SEA, ā'drī-āt'ik or ād'rī- (from the Etruscan city Hatria, modern Adria, at the mouth of the Padus or Po). A large arm of the Mediterranean Sea, separating Italy from the Balkan peninsula and communicating with the Ionian Sea by the Strait of Otranto. It is 500 miles long and about 130 miles in its greatest width (Map: Italy, J 4). Its depth varies from over 4000 feet in the southern part to about 500 feet in the north. Its west coast is almost unbroken, while the east is lined with numerous rocky islands, belonging to Istria and Dalmatia. The main gulfs of the Adriatic Sea are Manfredonia on the west, Venice and Triest on the north, and Quarnero on the northeast. The only considerable rivers emptying into it are the Adige and the Po, and that accounts for the great salinity of its water. The most important commercial points are Triest, Venice, Fiume, Ancona, and Brindisi. The navigation of the Adriatic is generally safe, although there are some dangerous points off the eastern coast. The commercial importance of the Adriatic Sea was greatly impaired by the opening of the sea route to India; but with the opening of the Suez Canal it has regained some of its former commerce. Consult: Jackson, *Shores of the Adriatic* (London, 1906); C. E. Yriarte, *Les bords de l'Adriatique* (Paris, 1878).

ADRIENNE LECOUVREUR, ā'drī-ēn' le-kōō'vrēr'. The title of a five-act French drama by Scribe and Legouvé, based on the tragic history of the noted actress. (See LECOUVREUR, ADRIENNE.) It was produced April 14, 1849.

ADRIFT'. Floating at random. The state of a boat, vessel, buoy, or other floating object which has parted or lost its lines or moorings and is driven about by the tide, sea, or wind; also the condition of a sail, gun, or other object which has broken loose from its fastenings.

ADSORP'TION. The condensation of a gas on the surfaces of solids, or of solutes on the surface of solid or colloidal particles suspended in a solvent, brought about in each case by a reduction in surface tension, or in some cases by chemical union. See COLLOIDS; SURFACE TENSION.

ADUA, ād'ū-ā. See ADOWA.

AD'UAT'UCI, or **AD'UAT'ICI**. A people of Belgic Gaul, dwelling in Julius Cæsar's time between Eburones and the Nervii, near the river Sambre, and conquered by him 57 B.C. They were descended from survivors of the Cimbri and Teutones after their defeat by C. Marius, 102-101 B.C. (Cæsar, *De Bello Gallico*, ii, 29).

ADULARIA, ad'ula'ria. See ORTHOCLASE.

ADULE, ā-dū'lē (Gk. Ἀδούλη, *Adoulē*). An ancient Ethiopian town on the Red Sea, near the modern Zula. It was an important trading post, especially for fine ivory. It is noted chiefly on account of two inscriptions of some importance relative to the ancient geography of those regions, known as the Monumentum Adulitanum, one celebrating the victories of Ptolemy Euergetes, the other the much later conquests of a native king. Both are of value for ancient geography, and were first published in the sixth century in the *Topographia Christiana* of Cosmas Indicopleustes.

ADUL'LAM. A city in the lowlands of Judæa, which was the abode of a Canaanite king before the conquest of the country by the Israelites (see Josh. xii. 15) and continued to be an inhabited town at least as late as the Maccabees. Its locality has been identified by some scholars with that of the modern Dier Dubban, some distance west of Bethlehem, and by others with that of Aid-el-ma, a few miles northeast of Hebron.

ADULLAM, CAVE OF. A cavern in southern Judæa, noted as a retreat of David while he was in hiding with his band of 400 outlaws from King Saul (see 1 Sam. xxii), and later when as king he was fighting the Philistines (1 Chron. xi. 15). It was perhaps near the town of the same name, some 10 miles northwest of Hebron.

ADUL'LAMITES. A term applied in English history to those seceding Liberals who voted with the Conservative party when Earl Russell and Mr. Gladstone sought to extend the elective franchise in 1866. The designation of *Adullamites* was fastened on the new party by Mr. Bright, who, in the course of debate, likened them to the political outlaws who took refuge with David in the cave of Adullam (1 Sam. xxii. 1, 2). The comparison was taken up by Lord Elcho, who humorously replied that the band congregated in the cave was hourly increasing, and would succeed in delivering the House from the tyranny of Saul (Mr. Gladstone) and his armor-bearer (Mr. Bright). The group of seceders was also known as "The Cave," and as "The Cave of Adullam."

ADULT'. A person of full age and therefore of full legal capacity, according to his status in point of sex or condition of servitude. The age at which one becomes an adult is generally fixed at 21 years for men and women alike, but in a few of the American States women are classified as adults on attaining the age of 18, and both men and women upon marriage. See AGE.

ADUL'TERA'TION (Lat. *adulterare*, to defile, to falsify). The act of intentionally debasing articles offered for sale, by abstracting from them some valuable constituent, or by adding to them some worthless, more or less deleterious, foreign substance. Adulteration has been practiced throughout the civilized world since early in the Middle Ages, and unfortunately the methods and devices used by unscrupulous men of commerce in adulterating commodities in common use have kept pace with the progress of the useful arts.

According to the Federal Food and Drugs Act of 1906 and the laws of many of the States a food is declared to be adulterated under the following conditions: "First, if any substance has been mixed and packed with it, so as to reduce or lower or injuriously affect its quality or strength; second, if any substance has been substituted wholly or in part for the article; third, if any valuable constituent of the article has been wholly or in part abstracted; fourth, if it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed; fifth, if it contains any added poisonous or other added deleterious ingredient which may render such article injurious to health . . . when such products are ready for consumption; sixth, if it consists in whole or in part of a filthy, decomposed, or putrid animal or vegetable substance, whether manufactured or not, or if it is the product of a diseased animal or one that has died otherwise than by slaughter."

The term "adulteration" is to be distinguished from "misbranding," which is usually applied to false or misleading statements on the package or label as to the contents of the package, its weight, place of manufacture, qualities, etc.

The sale of a spurious article under the name of the genuine article for which it is intended to pass is a common law cheat, and modern legislation is extending the scope of this crime with a view to the protection of health and the promotion of honest and fair business dealings. The common law cannot be depended on, however, to protect the community from adulterated goods, since the amount at stake is not sufficient to warrant the consumer in bringing action against the vendor who has sold him such goods. Since the middle of the last century the subject of food adulteration has attracted a constantly increasing amount of attention, and specific legislation intended to correct its evils is now widespread. In 1883 the first practicable food-inspection law in the United States was enacted in Massachusetts. Other States have gradually followed the example of Massachusetts, and, in 1913, all but two States had taken serious steps toward regulating the character and quality of their food products by enacting pure food laws, though their enforcement in three others was practically nullified by failure to grant appropriations. Food legislation has received much attention abroad, and the more highly civilized foreign countries have efficient food laws and enforce them with a degree of thoroughness which we in this country have not always attained. In this, as in so many other matters of national concern, the several States, with their varying standards and divergent interests, cannot be relied upon entirely to afford efficient protection against adulteration, and for this reason the legislative power of Congress was employed in 1906 to fix a standard for the whole United States. This could under the Constitution be effected only indirectly by the exclusion of foods falling below the legislative standard from foreign and interstate commerce, but though limited in scope these provisions are from their very nature comparatively easy of enforcement. For an analysis of this legislation and its provisions, see PURE FOOD LAW. See also HEALTH, PUBLIC.

The following are some of the more common forms of adulteration and sophistication, many of these, however, not being illegal if the products are properly labeled:

Wine. The cheaper grades of wine are sometimes colored artificially and chemically preserved. If made by the addition of water and sugar to the partially expressed pomace of grapes and then fermented, a qualifying term, such as "pomace wine," should be used. Carbonated wines, prepared by dissolving in ordinary wine carbonic acid gas under pressure, are sometimes sold as champagne.

Non-alcoholic beverages, such as ginger ale and fruit syrups, are often preserved with salicylic acid and benzoic acid, and colored with coal tar derivatives. These products are sometimes altogether artificial in their nature.

Canned vegetables, contrary to the general impression, are relatively free from adulteration, except that more water is sometimes used than is necessary. Being hermetically sealed, no artificial preservative is necessary, and, generally speaking, none is used. In this class of goods artificial color is sometimes employed with tomatoes, and some imported products, such as

peas, were formerly colored with salts of copper, but this is now prohibited. Vegetables, such as peas and beans, which have reached a relatively mature state, may be soaked for some time, canned, and placed on the market as high grade materials. Such products are not unwholesome, but should be labeled "Soaked." In the preparation of sugar corn a small amount of cane sugar is sometimes added, but must be declared. The use of saccharin for this purpose in place of sugar is rare, and is now prohibited in all foods.

Breakfast foods. In connection with the question of food adulteration, a word may be said as to the claims of breakfast-food manufacturers. These products are wholesome and convenient foods, but in nutritive value are in no way superior to the ordinary cereal products from which they are made.

Flour and bread are comparatively free from adulteration. The adulteration of flour with ground mineral matter and with alum was probably never practiced in this country. Its adulteration with corn-meal was quite prevalent at one time, but has now been discontinued in the United States. The bleaching of flour with nitrogen peroxid to whiten it prematurely was formerly practiced on a large scale, but prohibited under the Federal law in 1908. So-called "Graham flour" is frequently prepared by mixing low-grade white flour with bran.

Cocoa and chocolate preparations have been mixed with starchy cereal products and other starchy ingredients, such as wheat, rice, maize, arrowroot, and potato starch. An excess of cocoa husks is also reported in such preparations, showing that the husks have not been completely removed in the preparation of the product, or that an actual addition of husks has been made.

Coffee, when sold in the ground state, is easily adulterated. Chicory was formerly used almost entirely for this purpose, also ground peas, wheat, beans, barley, and other materials. Attempts have repeatedly been made to adulterate unground coffee with artificially molded pellets made to resemble the coffee bean, and composed of the constituents mentioned above. Such attempts have apparently not been successful, however, as products of this nature are no longer found in the market in this country. The principal offense in the coffee trade is misbranding in regard to country of origin; for example, the sale of Brazilian coffee, as Java or Mocha.

Catsups are commonly colored and preserved artificially. Some manufacturers prepare tomato pulp in large quantities when tomatoes are most plentiful and store it in barrels, using chemical preservatives to keep it and coloring matter to restore the loss of color.

Butter is frequently renovated after it has become stale, and much inferior country butter is treated in the same manner. The product is first washed with alkali to remove rancidity and the fat is churned with fresh milk. The practice of selling the product as fresh butter has been greatly lessened by Federal legislation, but "Renovated Butter," when labeled as such, may be manufactured and sold under Federal license. The sale of oleomargarin as butter is also much less common than formerly, as a result of Federal and State legislation.

Cheese was formerly adulterated by removing the cream from the milk from which it is made and replacing the cream by fat of other origin.

This "Filled Cheese" when so labeled may be manufactured and sold under Federal license. Another fraudulent practice consists in soaking the cheese curd in water to increase the moisture content and improve the texture.

Cream is sometimes preserved artificially and given a fictitious appearance by means of "thickeners," such as gelatin. A somewhat similar result is obtained by forcing cream through a "homogenizer," which breaks up the fat globules. This practice has some advantages, especially for ice cream making, but the product should be labeled "homogenized cream."

Milk lends itself very readily to adulteration. Considering the fact that a large portion of the milk supply is consumed by infants and invalids, its purity is a matter of greater importance than that of any other food. Milk is commonly adulterated by dilution with water or by removal of cream, and the water used may be a source of typhoid fever and other dangerous diseases. Skimmed milk contains a large amount of protein, and when sold on its merits is a most useful food, but of course it is unfit for infants and often for invalids. Milk is still frequently treated with chemical preservatives, chiefly formaldehyde. This enables the vendor to keep the milk at a higher temperature and to ship it over considerable distances without the use of refrigeration, and eliminates to an extent the necessity of cleanliness in the dairy. The addition of preservatives to such an article as milk, however, is almost universally considered to be inexcusable and is steadily decreasing.

Lard. Most of the States in this country have enacted specific laws governing the manufacture and sale of this product, and the adulteration of lard is now unusual. Cooking fats are commonly prepared by mixtures of cotton-seed oil, beef suet, etc., but they are usually sold as "compound lards" or "lard substitutes," and not represented to consist of lard alone. In order to correct the excessive softness of lard, high-melting stearin from beef fat is frequently added to it. The percentage of stearin added is higher in the summer than in the winter, and in the product consumed in hot climates than in that consumed in cold climates.

Salad oils. The substitution of cheaper oils for olive oil has always been far too common. A cheap adulterant is cotton-seed oil, although some sesame and peanut oils are imported for the purpose of adulterating cotton-seed oil. The enforcement of the pure food law has practically stopped the importation of adulterated olive oil in bottles, but the oils may be still imported in barrels and mixed in this country.

Flavoring extracts are easily adulterated with cheaper products. An extract of the tonka bean is frequently substituted for vanilla extract, and a still cheaper product is prepared in the form of a solution of artificial vanillin colored with caramel. Lemon extract is sometimes substituted by an extract prepared from lemon grass. Lemon oil is sometimes distilled with steam, the non-volatile product used for the preparation of the so-called terpeneless extract, and the terpenes obtained by this method of distillation used in the preparation of a product in which the non-volatile portions of the lemon oil are absent.

Jellies, jams, and marmalades are often adulterated with glucose and artificially colored and preserved. In the cheapest forms of these products no fresh fruit is employed, the product

consisting entirely of an extract prepared from dried apple peelings and cores and glucose, artificially colored and sometimes artificially flavored. As a result of recent legislation it is not uncommon for articles of this nature to be labeled with a declaration regarding their nature. Sometimes, however, these declarations are misleading.

Meat preparations occasionally contain preservatives and are adulterated by the substitution, in the case of comminuted articles, as sausage and chopped meat, of a cheaper article than that supposed to be present. Fresh meat is probably never subject to adulteration except on the block of butchers who are not equipped with storage facilities. Oysters, when kept in bulk after shucking, are sometimes treated with preservatives, and their bulk increased by absorption of water.

Spices are usually sold in the ground state and for that reason are easily imitated. They are frequently adulterated with ground cereals, coconut shells, almond shells, sometimes parched, and sawdust. Even the whole spices are sometimes distilled with steam to remove the essential oil and then placed on the retail market.

Sugars, both high and low grade, are practically free from adulteration, although at one time indigo was used in white sugar to counteract a yellow tint due to imperfect bleaching.

Syrups, strained honey, and similar preparations are often mixed with glucose, or corn syrup. Maple products may contain large amounts of cane sugar and should be properly labeled.

Vinegar in the United States is understood to be a product in the acetic fermentation of apple juice without any addition whatever, the products made from the juice of grapes, malt, sugar-house residues, glucose, etc., being properly qualified by these terms. The addition to natural vinegar of water, boiled cider, or coloring matter is regarded as adulteration unless they are labeled as imitation products. Diluted acetic acid and pyroligneous acids are not vinegar and should not be so sold.

Confectionery is deemed adulterated under the Federal law and that of most of the states if it contains terra alba, barytes, talc, chrome yellow, or other mineral substance or poisonous color or flavor, or other ingredient deleterious or detrimental to health, or any vinous, malt, or spirituous liquor or narcotic drug. The quality of cheap candies has been improved in recent years, particularly by the decreased use of injurious coloring materials, but the use of materials of inferior nutritive value is still possible.

Drugs are sometimes adulterated by the addition of substances resembling the genuine articles in outward appearance but having none of their valuable physiological effects. The practice cannot be denounced too strongly or punished too severely. The fraud can usually be detected only by careful chemical examination.

Chemical Preservatives. During the last half-century the practice of using chemicals to preserve food has been widely extended. By means of such chemicals foods may be preserved with much less desiccation than is possible otherwise, and the taste of the fresh article is retained practically unchanged. The substances most commonly employed have been formaldehyde with milk, borie acid with butter and with meat preparations, sulphites with beer, wine, dried fruits, molasses, and meat, and salicylic and benzoic

acids, and benzoate of soda with beverages of all kinds and fruit preparations. Fluorides have also been employed with many varieties of foods. Preservatives may cheapen the production of prepared foods, as with their use it is possible to transport and store products in a partially prepared state until it is convenient to complete the manufacture. It is possible, in making tomato catsup, for instance, to prepare the pulp, by cooking and straining off the insoluble material during the growing season and preserve it with salicylic or benzoic acid for working up later, so that a small plant can be kept in operation throughout the year. They also, however, sometimes make possible the use of inferior materials, and there is danger that they may be employed as a substitute for cleanly methods. The question as to the wholesomeness of some of the preservatives has not been definitely settled. It is conceded, however, that most of them are injurious to health, that they should not be employed where it is practicable to dispense with their use, and that wherever they are employed a plain statement of that fact should be made on the label. The Federal authorities permit the use of benzoate of soda, when its presence and amount are stated on the label, and of ordinary quantities of sulphur dioxide when its presence is stated.

Coloring Matter. The objection to the use of coloring matter with foods is from the standpoint of fairness and honesty and also from that of wholesomeness. In the adulteration of foods with articles of less value it is frequently found impracticable to select substitutes of the same color as that of the substances supposed to be employed. To remedy this defect and make the adulterated product more nearly resemble the article it simulates, coloring matter is added. Formerly coloring matter was obtained from vegetable sources. At present artificial colors are almost exclusively employed. The use of coloring matter has already been referred to above in connection with several articles of food. In addition to those mentioned, fruit jelly, prepared from glucose and apples, is frequently colored artificially to be sold as currant, strawberry, or grape jelly. Cane sugar is colored and flavored to resemble maple sugar. Glucose is colored and sold as honey, or as syrup of different origin. Canned tomatoes, which would bring a relatively low price because deficient in color, are frequently treated with an aniline dye. Flour is sometimes added to spices, such as pepper, and the natural coloring matter of the spice is replaced with charred coconut shells. Many colors which have been used with foods are admittedly unwholesome, and, furthermore, from the method of their manufacture, they may contain small amounts of poisonous metals, such as arsenic. Although, in general, the amount of coloring matter required is very small, it is believed that the use of those which are unwholesome should be prohibited. The United States and several European countries now forbid the use of certain colors, but specifically permit the use of others.

The enactment of Federal and state pure food legislation has already brought about great improvement in food manufacture and sale. Most of the grosser forms of adulteration are now comparatively unknown, and while many imitation products are found on the market, they are now required to be properly labeled and sold on their merits, thereby protecting the dis-

criminating consumer and the manufacturer of high grade goods.

Consult: In English, Wiley, Richardson, Crampton, and Spencer, *Foods and Food Adulterants*, 7 parts (Washington, 1887-92); Wedderburn, *Report on the Extent and Character of Food and Drug Adulteration* (Washington, 1894); Bower, *Simple Methods for Detecting Food Adulterations* (London, 1895); Blythe, *Foods, their Composition and Analysis* (London, 1903); Leach, *Food Inspection and Analysis* (New York and London, 1904, 1909, 1913); Leffmann and Beam, *Select Methods of Food Analysis* (2d ed., Philadelphia, 1905); Winton, *Microscopy of Vegetable Foods* (New York, 1906); Wiley, *Foods and their Adulterations* (Philadelphia, 1907, 1911); Walker, *The Food Inspector's Encyclopedia* (London, 1912); also the Bulletins and Reports of the Bureau of Chemistry, United States Department of Agriculture, and of the agricultural experiment stations and food commissions of various States. In German, Röttger, *Kurzes Lehrbuch der Nahrungsmittel-Chemie* (Leipzig, 1894); Bujard and Baier, *Hilfsbuch für Nahrungsmittel-Chemie* (2d ed., Berlin, 1900). In French, Bellenger, *Manuel de l'Inspecteur des denrées alimentaires* (Paris, 1894); Chevallier and Baudrimont, *Dictionnaire des altérations et falsifications des substances alimentaires, médicamenteuses et commerciales, avec l'indication des moyens de les reconnaître* (Paris, 1893-97); Girard, *Analyse des matières alimentaires* (2d ed., Paris, 1904); Courcelle and Ricard, *Traité des fraudes alimentaires agricoles et médicamenteuses* (Paris, 1909); Monier et al., *Traité théorique et pratique sur les fraudes et falsifications* (Paris, 1909), 2 vols.; Villiers et al., *Traité des falsifications et altérations des substances alimentaires* (Paris, 1911), 6 vols. See FOOD.

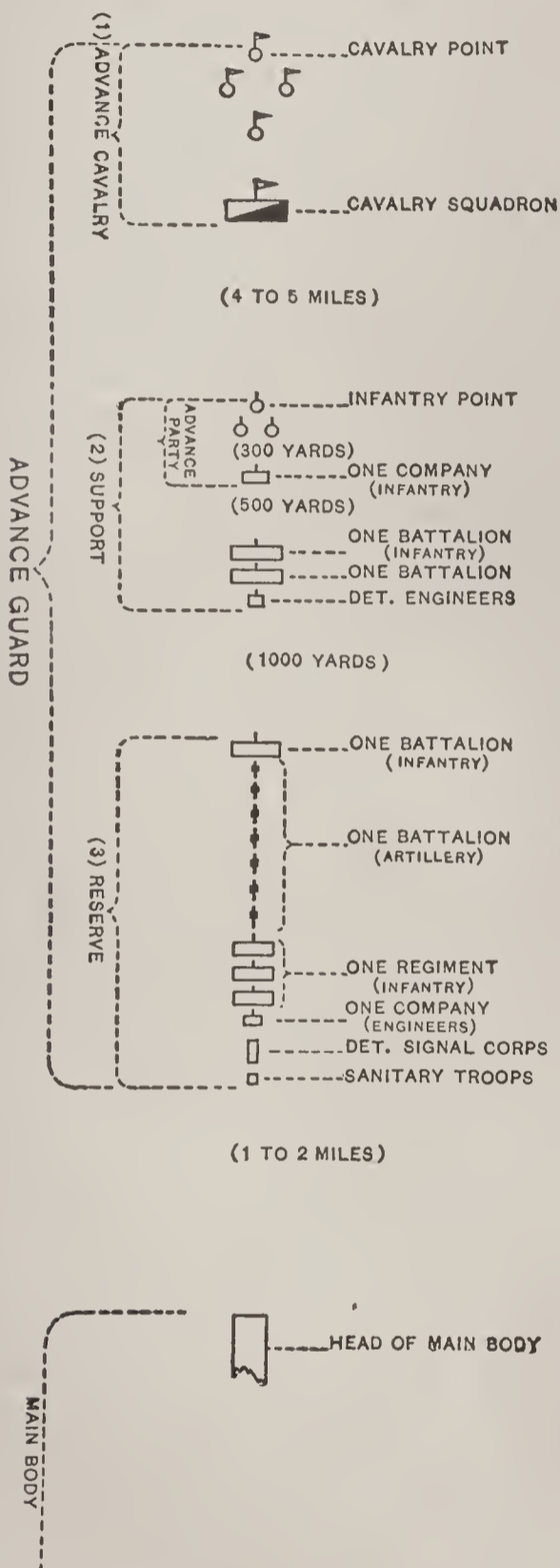
ADUL'TERY (Lat. *adulterium*, the violation of another's bed, from *ad*, to + *alter*, other). "The voluntary sexual intercourse of a married person with a person other than the offender's husband or wife." By the canon law, the husband and wife were placed on the same footing; and this view has been adopted by all the nations of modern Europe. In America it has never been doubted that the offense necessary to found the sentence of divorce is committed by unlawful sexual intercourse equally whether the *particeps criminis* were married or single. In Rome, the Julian law, enacted in the time of Augustus (17 B.C.), revised the previous legislation on the subject, and imposed special penalties, consisting of forfeiture of goods and banishment, both on the adulteress and the paramour. The husband, in certain cases, was permitted to kill the latter, and the father might sometimes kill both. A constitution of Constantine, the authenticity of which has been doubted, made adultery a capital offense on the man's part. Whatever Constantine's law was, it was confirmed by Justinian, who further condemned the wife to be whipped, and imprisoned in a convent for the rest of her days, unless relieved by her husband within two years (*Novel.*, 134, c. 10). The offense was visited in Athens with punishments closely resembling those of the earlier Roman legislation. In many Continental countries adultery is still treated as a criminal offense, but in none of them does the punishment now exceed imprisonment for a limited period, which is frequently accompanied with a fine. Lord Coke says that by the law of England in

early times adultery was punished by fine and imprisonment. During the Commonwealth it was made a capital offense, but this law was not confirmed at the Restoration. In Scotland the records of the Court of Justiciary show that capital punishment was frequently inflicted. At the present day it is punishable in Great Britain only by ecclesiastical censure, and even this may be regarded as in desuetude. But when committed by the wife it is regarded as a civil injury, and forms the ground of an action of damages for criminal conversation (commonly known as an action of *crim. con.*) by the husband against the paramour. No corresponding action was allowed the wife, either in England or America, until recently, and her only remedy consisted in obtaining a separation or divorce. In some of the States of the United States adultery is made criminal by special law; in some the act itself is not a crime, but open and continued adultery, amounting to a public nuisance, is. Some statutes define the crime, some only state the punishment; and this leaves a wide margin for interpretation by courts, giving rise to great diversity of opinions and decisions. Some hold that if only one of the parties be married, the other does not commit criminal adultery; some that a married man with a single woman does not commit criminal adultery, because the act cannot impose spurious issue on a husband or wife. See DIVORCE, and the authorities there referred to.

AD VALO'REM (Lat., according to the value). A phrase used in customs legislation to designate taxes levied upon goods in proportion to their value. The valuation which serves as a basis for the tax is commonly the fair selling value in the country of origin. When this is indeterminate, as in the case of goods produced solely for export, a more or less fictitious value is deduced from data as to cost, prices in the country of import, etc. Such duties, inasmuch as they fall with just proportion upon the different grades of goods, cheap as well as expensive, are in theory the most satisfactory. They involve, however, a cumbrous and often inefficient machinery for the ascertainment of values, and from the standpoint of customs administration are deemed inferior to specific duties, which levy a definite tax upon a given unit of measure (pound, bushel, gallon, etc.) of the imported articles. The tariffs of the United States embrace both kinds of duties and sometimes combine them. See TARIFF.

ADVANCE' GUARD. A detachment of troops which precedes the main body of the command for the purpose of insuring its safe and uninterrupted advance. Troops on the march are in a formation in which they cannot fight effectively. When they come upon the enemy they must first deploy. This takes time, especially in large columns; consequently such columns require detachments to protect them against surprise. The detachment placed at the head of the column is called the advance guard. Good reconnaissance by the independent cavalry in front of the army affords some protection, but this cavalry may at any time be beaten by the enemy and forced off to one flank, or it may have been drawn off in pursuit of the enemy's cavalry; hence immediate protection for the heads of the columns is still a necessity. The strength and composition of the advance guard depends on the tactical situation, but should be the least required, on account of the

arduous duty it demands. The strength of advance guards varies between one-ninth and one-third of the entire command, but seldom exceeds the latter, and in large commands is usually composed of all arms. In making details for advance guard duty the integrity of tactical units should be preserved. The larger the force the larger in proportion should be the advance guard. In open country it should be strong in cavalry and field artillery, but artillery is seldom assigned to the advance guard of a command not larger than a brigade. In difficult



country it may be formed of infantry alone. Machine guns are valuable with the advance guard. Engineers are usually present to remove obstacles, repair roads, place bridges, etc. The signal and sanitary troops required may also be attached. The field trains usually accompany those of the main body. The independent cavalry is a body of cavalry with an independent mission and precedes the advance guard by a day's march or more. The advance guard is composed of the advance *cavalry*, the *support* and the *reserve*. Communication between these parts is maintained by wire, messenger service, or signals. The strength, composition, designation of parts, and distribution of the troops composing the advance guard of a normal division of about

18,000 men, are indicated in the accompanying diagram. The advance guard is here assumed to consist of two regiments of infantry, one squadron of cavalry, one battalion of artillery, one company of engineers, and a detachment of sanitary troops.

If the main column halts for a considerable time, the advance guard takes up temporarily the duties of outposts, but must keep up reconnaissance. Every column of march must also be protected on the flanks by patrols, and when these small bodies are not sufficient a flank guard must be organized.

In a retreat a rear guard is formed, and since the latter cannot, as a rule (like the advance or flank guard), count on the immediate support of the main body, it must be stronger than either of the others, and requires more artillery, and also cavalry, the latter playing the part of mounted infantry in this case. All European armies, except the German, have a small rear guard besides the advance guard in an advance. France and Russia have very strong advance guards and send them far out to the front. See **OUTPOSTS; RECONNAISSANCE; BATTLE; TACTICS, MILITARY.**

ADVANCEMENT. In law, a gift by a parent to a child of all or a portion of the share of the parent's personal property to which the child would be entitled upon the death of the parent intestate. An advancement has the effect of reducing by its amount the distributive portion that would come to the receiver upon the death of the parent. The doctrine of advancement is applicable only to gifts from parent to child, but has been extended to gifts to others by statute in some States. An advancement is not required to be made in any particular form. Any such gift is presumptively an advancement, but the contrary may be shown. The subject is now generally regulated by statute, and in many jurisdictions real estate may be given by way of advancement to the heir. Consult Thornton, *Law Relating to Gifts and Advancements* (Philadelphia, 1893). See **ADEMPMENT.**

ADVANCEMENT OF SCIENCE, ASSOCIATIONS FOR THE. Important bodies of scientific men in America, Great Britain, France, and other countries. The purpose of these associations is to emphasize the solidarity and unity of interests among workers in all branches of science, to give a stronger impulse to scientific research, both theoretical and practical, and to gain for scientific achievement a more immediate recognition and a wider usefulness, through the means of financial bequests, the publication of *Reports*, and the offering of special facilities for the prosecution of original and difficult scientific work. The organization of the societies was one of the numerous manifestations of the scientific spirit of the nineteenth century; and the continued growth of this spirit was shown at a joint meeting of the British and French associations in September, 1899, when plans were formulated for an international association for the advancement of science, art, and education. The first meeting of this international association was held in Paris during the exposition of 1900. The American Association for the Advancement of Science, now one of the most noted scientific societies of America, was founded in 1847 as an outgrowth of the association of American geologists and naturalists. The association is organized in 11 sections, each of which holds its own convention at the annual

meeting of the association during the summer. The sections embrace the following departments of science: *A*, mathematics and astronomy; *B*, physics; *C*, chemistry; *D*, mechanical science and engineering; *E*, geology and geography; *F*, zoölogy; *G*, botany; *H*, anthropology and psychology; *I*, social and economic science; *K*, physiology and experimental medicine; and *L*, education. The association also serves as a centre for the meeting of a number of important special scientific societies which have become connected with it. The association publishes annually a volume of *Proceedings*, and in 1901 became affiliated with the journal *Science*, making it the semi-official organ of the society. The membership of the society is about 8100. The British Association for the Advancement of Science was founded in the city of York in 1831, under the leadership of David Brewster and with the coöperation of many of the most prominent men of the time. The annual meetings of the association are held for a week each summer and consist mainly of papers read before the several sections of the society and of conferences following them. The society is divided into 10 sections, each having its own president and governing committee. The society sets aside yearly a large sum for the prosecution of scientific researches which require special apparatus and the employment of assistants. The membership of the association is about 5500. Reports have been published since 1831. The French Association for the Advancement of Science (*L'Association Française pour l'Avancement des Sciences*) was formed in 1865 at Lille. The work is carried on through general meetings, publications, and the bestowal of prizes for brilliant scientific work. The four sections into which the society is divided are those of the mathematical, the physical and chemical, the natural, and the economic sciences. Records of its proceedings and of the scientific work accomplished under its guidance have been published since its organization. The Australasian Association for the Advancement of Science was formed in 1886 and the South African Association in 1903.

AD'VENT (Lat. *adventus*, the approach, coming), or **TIME OF ADVENT**. A term applied by the Christian Church to certain weeks before Christmas. In the Greek church the time of Advent comprises 40 days; but in the Roman church and those Protestant churches in which Advent is observed, only four weeks. The origin of this festival as a church ordinance is not clear. A synod at Saragossa, Spain, in 380, enjoined that every one must attend church from December 17 to Epiphany; but not till the sixth century was Advent fully adopted as a church season. The four Sundays of Advent, as observed in the Roman Catholic church and the Church of England, were probably introduced into the calendar by Gregory the Great. It was common from an early period to speak of the coming of Christ as fourfold: his "first coming in the flesh"; his coming at the hour of death to receive his faithful followers (according to the expressions used by Saint John); his coming at the fall of Jerusalem (Matt. xxiv. 30), and at the day of judgment. According to this fourfold view of Advent, the "gospels" were chosen for the four Sundays, as was settled in the western church by the Homiliarium of Charlemagne. The season of Advent is intended to accord in spirit with the object celebrated.

As mankind were once called upon to prepare themselves for the personal coming of Christ, so, according to the idea that the ecclesiastical year should represent the life of the founder of the Church, Christians are exhorted, during this season, to look for a spiritual advent of Christ. The time of the year when the shortening days are hastening toward the solstice—which almost coincides with the festival of the Nativity—is thought to harmonize with the strain of sentiment proper during Advent. In opposition possibly to heathen festivals, observed by ancient Romans and Germans, which took place at the same season, the Catholic church ordained that the four weeks of Advent should be kept as a time of penitence; according to the words of Christ, "Repent, for the kingdom of heaven is at hand." During these weeks, therefore, public amusements, marriage festivities, and dancing were prohibited, fasts were appointed, and sombre garments were used in religious ceremonies. The Protestant church in Germany has also abstained from public recreations and celebrations of marriage during Advent. In the Greek church the observance of the season dates from a period much later than in the Latin, perhaps not till the tenth century.

AD'VENTISTS. A family of religious denominations which, accepting the inspiration of the Scriptures, taking the Bible as their rule of faith, and holding to the fundamental doctrines of the Christian churches generally, expect the near approach of the end of the world and the personal second coming of Christ. They arose from the preaching of William Miller, who taught, from 1831 on, as the results of his studies of the prophetic books of the Bible, that the end of the world would come in 1843, and be followed by the coming of Christ and the installation of the millennium. When 1843 had passed, the date was changed to October, 1844. Mr. Miller was joined by other preachers, and several thousand followers were gathered from many churches. The Adventists now, as a rule, simply await the second advent without attempting to fix a date for it. A declaration adopted at Albany, N. Y., in 1845, set forth a belief in the visible personal coming of Christ at an early but indefinite time; the resurrection of the dead, both the just and the unjust, and the beginning of the millennium after the resurrection of the saints; but denying that there is any promise of the world's conversion, and that the saints enter upon their inheritance at death. The Adventists baptize by immersion; and, except the Seventh Day branch and the Church of God, are congregational in polity. Carroll, *The Religious Forces of the United States* (New York, 1912).

1. **The Evangelical Adventists**. The American Millennial Association was formed in 1845 for the publication and circulation of denominational literature. The Evangelical Adventists began to call themselves by that name in 1845. They believe that all the dead will be raised, the saints first, to the enjoyment of the millennial reign with Christ and eternal bliss after the judgment, and the wicked last, to be sent into everlasting punishment, and that the dead in Hades are conscious. They had, in 1913, 8 ministers, 18 churches, and about 1150 members. Literature: H. F. Hill, *The Saints' Inheritance* (Boston, 1852); D. T. Taylor, *The Reign of Christ* (Boston, 1889); J. Litch, *Discussion on the Millennium* (Boston, between 1860 and 1865).

2. **Advent Christians.** The general association of this body was formed in 1861. The Advent Christians believe that man was created for immortality, but forfeited it through sin and can become partner of the divine nature and live forever only through faith in Jesus Christ; that death is a condition of unconsciousness to all till the resurrection at Christ's second coming, when the righteous will receive everlasting life and the wicked will be punished with complete extinction of being; and that salvation is free to all who will accept the conditions. They have, in the United States, 528 ministers, 550 churches, with about 26,800 members, and a Bible institute. The principal publication society is in Boston. The missionary society sustains missions in England, the Cape Verde Islands, India, and China. In home missions it is aided by the Eastern, Western, and Southern Boards, and by the woman's society called "The Helper's Union." It also has charge of a church extension fund. The leading periodicals are *The World's Crisis*, and Sunday school publications (all Boston). Literature: J. G. Wellcome, *History of the Second Advent Message* (Yarmouth, Me., 1874); Charles L. Ives, *The Bible Doctrine of the Soul* (Philadelphia, 1877); E. A. Stockman, *Our Hope* (Boston, 1884); Mrs. L. C. McKinstrey, *The World's Great Empires* (Haverhill, Mass., 1887); Rev. H. Constable, *Hades or the Intermediate State of Man* (Boston, 1885).

3. **Seventh-Day Adventists.** The doctrine of the obligation of the seventh day as the Sabbath was adopted by a body of Adventists at Washington, N. H., in 1844. The Seventh-Day Adventists believe that Christ's closing work as priest—the cleansing of the sanctuary and the investigative judgment—are events marked in the prophecies as beginning in 1844. They hold that the dead sleep until Christ's second coming; that the righteous dead are raised to life and with the living righteous are made immortal; that the wicked are destroyed by the glory of Christ's presence; and that the second resurrection, that of the wicked, takes place at the end of a thousand years. During this millennium the righteous are in heaven, the earth desolated, and empty of its inhabitants. They believe that Christ's coming is near, but set no time for that event, maintaining that it is hidden from all mortals. They believe in the restoration in the Church of all the gifts of the Spirit, bestowed by Christ, including the gift of prophecy, believing the writings of Mrs. E. G. White to be special illuminations of the Spirit, though adding nothing to the doctrine of the Holy Scriptures, which are held to be the sole and sufficient standard of faith and doctrine. They believe that the whole Bible is inspired and look to Christ alone for salvation and righteousness.

The chief governing body is the General Conference, having headquarters in Washington, D. C. The General Conference is divided into 23 Union Conferences, embracing practically the entire world. Union Conferences are composed of a group of local conferences, of which there are 126, and 100 mission fields. At the close of 1912 operations were being carried on in 86 countries, by 863 ordained ministers, 492 licensed ministers, and other evangelistic workers, making the grand total of evangelistic laborers approximate 6000. The number of evangelistic laborers in non-Christian and non-Protestant

lands is 1481, thus constituting this denomination the sixth in point of total missionaries in foreign service of all the missionary societies in the United States. Over 500 missionaries have been placed in service in foreign lands during the past five years; the contributions for foreign missions from the membership in the United States during 1912 were \$619,826.85, a per capita of \$9.40. Missionary work is conducted in 91 languages. The total funds raised annually for evangelistic purposes approximate \$3,000,000. In 1912 the denomination had 2874 churches and 114,206 communicants. The denomination has 69 sanitariums; 90 colleges and intermediate schools, 573 primary schools; total investment in denominational institutions exceeds \$13,000,000; 123 periodicals are regularly issued in 31 languages. The leading weekly periodicals are *The Advent Review and Sabbath Herald* and *The Youth's Instructor* (Washington, D. C.); *Signs of the Times* and *Our Little Friend* (Mountain View, Cal.); *The Present Truth* (Watford, England); *Signs of the Times* (Warburton, Australia); *The Gospel Messenger* (Danish), (College View, Neb.). The monthlies include *Liberty, Life and Health*, and *Protestant Magazine* (Washington, D. C.); *The Watchman* (Nashville, Tenn.); *South African Sentinel* (Cape Town, South Africa); *Herald of Truth* (German), (Hamburg, Germany); *Signs of the Times* (Glarus, Switzerland); *Signs of the Times* (Shanghai, China); *Oriental Watchman* (Lucknow, India); *West Indian Watchman* (Riversdale, Jamaica).

The literature of the denomination is issued from 37 publishing houses, in 75 languages, in the form of 350 bound books, over 300 pamphlets, and about 1200 tracts, and annual literature sales approximate \$2,000,000. Among the leading works may be mentioned *History of the Sabbath and First Day of the Week*, by J. N. Andrews and L. R. Conradi; *The Great Controversy between Christ and Satan, Desire of Ages*, and *Patriarchs and Prophets*, by Mrs. E. G. White; *Thoughts on the Book of Daniel and the Revelation*, by Uriah Smith; *The Great Second Advent Movement*, by J. N. Loughborough; *Heralds of the Morning*, by A. O. Tait.

4. **The Church of God.** This was formed after a division among the Seventh-Day Adventists, 1864-65, concerning the acceptance of the revelations of Mrs. E. G. White as inspired and the application of Rev. xii. 11-17 to the United States. It holds to the mortality of man and unconsciousness in death; resurrection of the righteous to everlasting life and of the wicked to judgment and final extinction; observes the seventh day and practices tithing. The general conference is the head of its work, and the State conferences are subordinate to it. It has 32 ministers, 20 churches, and about 600 members, with a publishing house at Stanberry, Mo., and a sanitarium at White Cloud, Mich. Periodicals: *The Bible Advocate*, *Herald of the Coming Kingdom* (Stanberry, Mo.). Literature: A. P. Dugger, *Bible Sabbath Defended* (Marion, Iowa, 1881); Jacob Brinkerhoff, *Kingdom of Heaven upon Earth* (1882); W. C. Long, *The End of the Ungodly* (1886).

5. **Life and Advent Union.** Organized 1860. The distinctive feature of its belief is that those who die in sin have no resurrection, but are doomed to sleep eternally, while the righteous rise to immortality. A general conference meets every year, and quarterly conferences have been

instituted in some places. Four camp-meetings are held every year—in New England and Virginia. The missionary work is carried on, in the home field only, by two societies, one of which is organized among the young people. The Union has in the United States 12 ministers, 12 churches, and about 500 members. Literature: O. S. Halstead, *The Theology of the Bible* (Newark, N. J., 1860); *Discussion between Miles Grant and J. T. Curry* (Boston, 1863); W. N. Pile, *The Doctrine of Conditional Immortality* (Springfield, Mass.); *The Coming Kingdom of God* (Springfield, Mass.); Wm. E. Brown, *The Divine Key of Redemption* (Springfield, Mass.); "A Disciple," *Redemption* (Springfield, Mass.).

6. **The Churches of God** (Age-to-Come Adventists) believe in the final restitution of all things; the establishment of the kingdom of God on the earth, with Christ as King of kings and the immortal saints joint heirs with him; the restoration of Israel; the final destruction of the wicked, and eternal life only through Christ. The journal, *The Restitution*, was begun in 1851, and a general conference representing 13 States was formed in 1888. The Churches have 56 ministers, 62 churches, and about 2100 members in the United States, and churches in Canada. Periodical: *The Restitution* (Plymouth, Ind.). Literature: J. P. Weethee, *The Coming Age* (Chicago, 1884).

ADVENTIVE (Lat. *ad*, to + *venire*, to come). A plant which is but incompletely naturalized (see NATURALIZATION) is said to be adventive. Most adventive plants are spontaneous for a few years and then disappear, while a few species become more and more numerous and ultimately become naturalized.

ADVENTURES OF AN ATOM, THE. A satire by Tobias Smollett (q.v.) published in 1769 and treating, under a Japanese disguise, of English politics during the preceding 14 years.

ADVERB (Lat. *adverbium*, from *ad*, to + *verbum*, word, verb, "the word" of a sentence *par excellence*. A literal translation by the Roman grammarians of the Gk. *ἐπιρρημα*, *epirrhēma*, from *ἐπί*, *epi*, at + *ῥῆμα*, *rhēma*, word, verb). As an adjective is joined to a noun, so is an adverb joined, for analogous purposes, to a verb, an adjective, or another adverb. From the frequency with which adverbs are joined to verbs, only the adverbs of degree modifying other parts of speech, they get their name. An adverb cannot be the subject, the copula, or the predicate of a proposition, and is, therefore, a secondary part of speech, logically speaking. According to their signification, adverbs may be divided into (1) adverbs of place and direction, as *where*, *towards*; (2) of time, as *ever*, *immediately*; (3) of degree, as *very*, *almost*; (4) of manner, as *thus*, *wisely*; (5) of belief or doubt, as *perhaps*, *no*, etc. It is commonly said that "some adverbs admit of comparison," as if in this respect they differed from adjectives. The truth is that adverbs admit of comparison under the same limitations, neither more nor less, that restrict the comparison of adjectives. Thus, *soon* is compared as naturally as *hard*. If *now* or *thus* cannot be compared, neither can *woolen* nor *circular*; and in both cases for the same reason—the sense forbids it. The laws of euphony prevent alike *miserable* and *miserably* from being compared grammatically, i.e., by the addition of *er* and *est*; but both admit of logical comparison by the use of

more and *most*. A large class of adverbs in English are formed from adjectives by annexing the syllable *ly*, which is derived from the word *like*. Most languages have some such means of distinguishing the adverb from the adjective, but in German they are alike. Adverbs in general may be looked upon as abbreviations of phrases; thus, *here* = *in this place*, *then* = *at that time*, *wisely* = *like a wise man*. Combinations of words that can thus be represented by a single adverb, and all combinations that are analogous, though they may have no single word equivalent to them, are called adverbial expressions.

ADVERSE POSSESSION. The possession of lands under a claim of title inconsistent with that of the true owner. It originates in the disseisin (q.v.) or ouster of the freehold tenant and, if continued for the statutory period of limitation, results in the acquisition of a complete title by the adverse possessor or disseisor. In order to constitute a good adverse possession there must be an actual occupancy (*pedis possessio*) of the premises claimed and an exclusion of the rightful owner from the whole thereof. The possession must be open and notorious and continued without interruption for the requisite period. It need not be continued by one and the same person, however; a subsequent occupant who claims by descent, devise, or grant from a former occupant being entitled to tack his possession to that of his predecessor in order to make up the requisite period of adverse holding. In some of the United States it is not even necessary that the subsequent occupant shall show a legal transfer of the property to him so as to connect his possession with that of the original disseisor in order to tack the two periods. The claim of title required of the adverse possessor is not an assertion of a legal right, but only an obvious intention to hold as owner. This may be innocent, as under a will or deed which proves to be void or unintentional, as by the accidental inclusion of another's land with that of the occupant, or it may be with the deliberate intention of gaining for one's self land belonging to another. The existence of the requisite intention, or claim of title, is a question of fact to be determined from the circumstances of the occupancy. In some of the United States certain acts (as fencing, improvement of the premises, or actual residence) have been prescribed by statute as requisite to prove the intention. In general the claim of the adverse possessor is limited to the land actually occupied; but where the claim is under color of title (i.e., under a deed, will, or other instrument describing a definite parcel of land) the actual occupation of a part may be extended by construction to the whole parcel so described. This doctrine of "constructive adverse possession" is a modern addition to the law of disseisin and is peculiar to the United States. The period of time required to ripen an adverse possession into a valid and indefeasible title varies greatly, but it is usually fixed by statute at 20 years. (See LIMITATION OF ACTIONS.) The subject is fully considered in all the leading treatises on real property. Leake and Williams are the modern English authorities. For the American doctrine see Tiffany, *The Modern Law of Real Property* (St. Paul, 1903).

ADVERSITY HUME. A nickname given to the parliamentarian Joseph Hume (q.v.), who was noted for his attention to financial

abuses in the government, and whose predictions of a crisis were justified in 1825.

ADVERTISEMENT, ăd-vēr'tiz-ment or ăd-vēr-tiz'ment. In legal phraseology, a process resorted to whenever actual notice is necessary but is legally or physically impossible (as by reason of a want of jurisdiction of the parties to be notified, or ignorance of their whereabouts). Publication must be made in a newspaper published at or as near as possible to the place where the persons to be affected when last heard of resided. Such advertisement in law is construed to have the same effect as actual service of the notice, as, for example, in proceedings brought to foreclose a mortgage or other lien on real property. An attempt to notify personally all parties affected would often only result in delay, if not miscarriage, of justice. For advertisement in business, see **ADVERTISING**.

ADVERTISEMENTS OF ELIZ'ABETH.

A series of enactments issued by Parker (q.v.), Archbishop of Canterbury, in 1566, for the purpose of establishing "due order in the public administration of Common Prayer and using of Holy Sacraments." Enforcing as it did the wearing by the clergy of the surplice and college cap, and of the cope in cathedrals and collegiate churches, it was in harmony with Elizabeth's love for decency and order in public worship; but after waiting more than a year for her official sanction, and long correspondence with Cecil, Parker was obliged to issue it on his own responsibility. During the latter half of the nineteenth century there was much controversy as to the exact force of the advertisements, which came to a head in the Ridsdale ritual case of 1877. Lord Selborne held that they were an absolute and authoritative prescription of the vestments to be worn, contending that they were the "other order" mentioned in the Act of Uniformity as to be taken later; while the High Church party, ably represented by James Parker, considered them as merely archiepiscopal injunctions intended to enforce a minimum of ritual. Consult Strype, *Life and Acts of Matthew Parker* (Oxford, 1821).

ADVERTISING (Lat. *advertere*, to turn [the mind] to, to notice). The method by which the producer of commodities disseminates information regarding them. For the producer it has the value of an automatic process, since it makes it possible to reach thousands of people through printed words, where formerly the seller was limited to his vocal organs. For the consumer it has the value of a system of education, since it keeps him in touch with the invention of new commodities, the improvement of old, and the constant advance in industry.

In tracing back the history of advertising, signs and criers are found in Palestine, Greece, and Rome, where they were used for public announcements and a few private purposes. Pompeii has furnished us with many wall inscriptions in red and black, as well as the familiar Roman signs, the amphora and two slaves for a wine shop, a goat for a dairy, or a boy being whipped for a school. Quaint signs prevailed throughout the Middle Ages, and the public crier was an important institution in towns. It was, however, the advent of printing and later of the newspaper which provided an adequate medium for advertising, although it was not until the industrial changes of the nineteenth century had revolutionized production,

creating innumerable new commodities and stimulating new wants, that advertising could become an important feature of commercial life. In the seventeenth century small advertisements appear in the newspapers for books, tea, coffee, or medicine. The chief advertisements for a hundred years or more are curiously illustrative of the crude social customs. A heavy stamp tax hampered the growth of newspapers and advertising in England until 1855.

America is par excellence the country of the advertiser. In the Colonial papers advertisements furnish material for history. Brief notices tell of new goods just imported from England, coffee, slave sales, runaway slaves and servants, or lost cattle. Advertising has grown with the newspapers. In 1795 there were 200 newspapers in the United States; in 1850, 2526; and in 1913, 24,381. Newspaper advertising on a large scale dates from the establishment of the *New York Sun* in 1833, followed shortly by the *New York Herald*, the *Philadelphia Public Ledger*, and the *New York Tribune*. According to census reports the sums paid for advertising in newspapers and other periodicals were, in 1899, \$95,861,127; in 1904, \$145,517,591; in 1909, \$202,533,245. Receipts from advertising represented 55 per cent of the total income of newspapers and other periodicals in 1899; 56.6 per cent in 1904; 60 per cent in 1909. The amount annually spent on advertising in the United States is variously estimated at from \$300,000,000 to \$500,000,000. The mediums for advertising are as follows: (1) the newspapers, magazines and trade journals; (2) occasional literature, such as catalogues, booklets, circulars, almanacs, calendars, or handbills; (3) street advertising, including bill-boards (see **POSTER**), stereopticons, signs, and street-cars; (4) salesmen; and (5) personal advertising.

As early as 1850 there existed in New York agencies whose function it was to arrange rates with newspapers, to gather information as to the extent and character of newspaper circulation, etc., for the guidance of the advertiser. At that time advertisements consisted commonly of plain statements of the character of the things offered for sale. With the enormous development of the patent medicine industry after the Civil War advertising assumed a more complicated technique. Illustrations were required, and a nice adjustment of character of advertisement to territory covered. In the 80's and 90's there was a great development of advertising through illustrated catalogues. Examples of businesses built up through such advertising are the "mail order houses" and the garden seed concerns. After 1890 there was a vast increase in the production of trade-marked articles of personal and household use which were wholly dependent upon advertising for a market. The "advertising campaign" became a characteristic feature of American business. The management of such campaigns made necessary the development of a new type of advertising agency, well supplied with capital, having at its command a corps of highly trained writers and illustrators and possessing a complicated technical apparatus in the form of records of advertising experience, etc.

Advertising methods are still essentially empirical. Whether a given form of advertising will be profitable is left to the judgment of advertising experts, and in many cases an elaborate and expensive campaign proves fruitless.

A business advertising in many newspapers and other periodicals of various classes usually attempts, through direct or indirect means, to ascertain how much business is secured through each medium or through each form of advertisement. In this way wasteful and ineffective advertisements are gradually eliminated. Since, however, novelty is an important factor in securing public attention, this process of experimentation must go on continuously. It has been urged that by the employment of experimental psychology much of the waste of ineffective advertisements could be avoided. Experiments have been carried on in the laboratories of Professor Münsterberg at Harvard and Prof. W. D. Scott at Northwestern University with a view to establishing the effectiveness of scientific methods in advertising. Practical advertisers, while admitting the value of such studies, are generally skeptical as to the possibility of reproducing in the laboratory the conditions which the business advertisers must meet.

Efforts to Prevent Abuses in Advertising. The choice of farmers' barns and fences and more especially of rocks and prominent scenic effects for the placing of advertisements has led to various efforts to stop such abuses. A number of London societies interested in preserving historical sites or beautiful places incidentally make efforts in this direction. The Society for Checking Abuses in Public Advertising—now generally known as "Scapa" (q.v.)—is the leader in this work. It publishes circulars and asks for parliamentary action. Dr. G. Alder Blumer, Superintendent of the State Asylum at Utica, N. Y., started a crusade in 1898 to preserve the rural scenery in that vicinity. He obtained farmers' addresses from the Good Roads League and sent them Scapa circulars. The New York Central Railroad has made an effort to get rid of unsightly advertising along its line. The nuisance of circulars has been met in some cities, as in Philadelphia, by ordinances forbidding their distribution. The city of Chicago attempts to regulate advertising on the streets through restrictions upon the size of bill-boards, etc. A tax upon bill-boards, graduated according to area, has been employed in some European cities and has been urged upon various legislatures in the United States.

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ADVICE. See BILL OF EXCHANGE.

AD'VOCATE (Lat. *advocatus*, one called to aid, from *ad*, to + *vocare*, to call). In the time of Cicero the term *advocatus* was not applied to the patron or orator who pleaded in public, but rather, in strict accordance with the etymology of the word, to any one who in any piece of business was called in to assist another. Ulpian defined an advocate to be any person who aids another in the conduct of a suit or action (Digest 50, title 13), and in other parts of the Digest it is used as equivalent to an orator (see also Tacit., *Annal.*, x, 6), so that the word would

seem gradually to have assumed its modern meaning. The office of the advocate or barrister who conducted the cause in public was, in Rome, altogether distinct from that of the *procurator*, or attorney, or agent who represented the person of the client in the litigation, and furnished the advocate with information regarding the facts of the case. The distinction between these two occupations is still observed in Great Britain, but in many of the States of Germany, in Geneva, in the United States, and in some of the British colonies, as, for example, in Canada, they are united in the same person. In England and Ireland advocates are called barristers, under which title will be found a statement of the duties and responsibilities which the advocate undertakes to his client and of the state of the profession in these countries. In Scotland, as in France, the more ancient name has been retained. In France the *avocat* and *avoué* correspond very nearly to the barrister and attorney in England. The French advocate is simply a free man who has graduated in law and possesses the privilege of addressing the tribunals. The advocates who practice in each court form a separate college, admission to which can be obtained only with the approval of those who are already members. The French advocate possesses the same privileges as to irresponsibility for his advice, and for the facts contained in his instructions, which belong to members of the corresponding branch of the legal profession in Great Britain. As he has no action for his fees, they are required to be paid in advance. His functions correspond to those of the counsel, as distinguished from the attorney-at-law, in the United States. In Belgium, in Geneva, and also in those of the German States in which the Code Napoléon has been adopted, the organization and discipline of this branch of the legal profession are similar to those which prevail in France. In the other German States, with the exception of Saxony, the formation of the advocates into a body has been perseveringly resisted by the governments. See ATTORNEY.

ADVOCATE, LORD. The public prosecutor of crimes in Scotland, senior counsel for the crown in civil causes, and a political functionary of great importance in the administration of Scottish affairs. He may issue warrants of arrest and imprisonment in any part of Scotland, is entitled to plead within the bar, and possesses many other discretionary and indefinite powers. He is a member of Parliament and, as first law-officer of the crown for Scotland, is expected to answer all questions relating to the business of Scotland and to take the superintendence of legislation for that portion of the United Kingdom. The corresponding office in the English system, that of the king's or queen's advocate, once of equal dignity and importance, has lately become obsolete, and its functions devolve upon the attorney-general and the solicitor-general (q.v.). In some of the English colonies and in the Indian presidencies, however, the title "advocate" is retained to describe the chief law officer of the crown. Consult Bell, *Dictionary and Digest of Law of Scotland* (Edinburgh, 1890).

AD'VOCATES, FACULTY OF. An incorporated society in Scotland, composed of about 400 lawyers who practice in the highest courts. Applicants for admission are required to pass an examination following a prescribed course of study. From the membership vacancies on the bench are supplied.

ADVOCA'TUS DIAB'OLI, dī-āb'ō-lī (Lat. the devil's advocate). In the Roman Catholic church, when it is proposed that a sanctified person shall be canonized, an examination of his past life takes place. In this process one party holds the office of accuser, or *advocatus diaboli*, and it is his duty to bring forward all possible objections against the proposed canonization; while, on the other side, the *advocatus Dei* (God's advocate) undertakes the defense. Hence the term *advocatus diaboli* has been applied to designate any person who brings forward malicious accusations. See CANONIZATION.

ADVOW'SON (A. Fr. *advœson*, OF. *avoesson*, patronage, from Lat. *advocatio*, legal assistance). In English law, the right, as patron, to present or appoint a curate to a church or ecclesiastical benefice. Advowsons are either appendant or in gross. Lords of manors were originally the only founders and the only patrons of churches, and the advowsons, when created, were usually made an incident or appurtenance to the manorial estate, which would pass with it upon alienation. So long as the advowson continues annexed or appended to the manor, it is called an advowson appendant. Such rights are conveyed with the manor as incident thereto by a grant of the manor only, without adding any other words. But where the advowson is created independently of the manor, or has been once separated from the property of the manor by legal conveyance, it is called an advowson in gross or at large. It is thus no longer incident to the property of the manor, and may be conveyed and disposed of independently of it. Advowsons are classed by Blackstone as the first of the incorporeal hereditaments, and they still constitute in England an important class of property interests. They do not exist in the United States. Consult Stephen, *New Commentaries on the Laws of England* (13th ed., London, 1899); Phillimore, *Ecclesiastical Law of the Church of England* (2d ed., London, 1895); Addy, *Church and Manor* (London, 1913).

ADY, ā'dī (Mrs. HENRY) JULIA (CARTWRIGHT). An English writer and art critic. She was born at Edgcott, Northamptonshire, and was educated privately. In 1880 she married Rev. W. H. Ady. Her published writings include, besides numerous novels and contributions to reviews and magazines: *The Pilgrim's Way* (1892); *Sacharissa* (1893); *Madame: The Life and Letters of Henrietta, Duchesse of Orleans* (1894); *Life and Work of Sir Edward Burne-Jones* (1894); *J. F. Millet: His Life and Letters* (1896); *Life and Letters of J. G. F. Watts* (1896); *Bastien-Lepage* (1895); *Christ and His Mother in Italian Art* (1897); *Beatrice d'Este, Duchess of Milan* (1899); *The Painters of Florence* (1901); *Isabella d'Este, a Study of the Renaissance* (1903); *Sandro Botticelli* (1904); *Raphael* (1905); *Hampton Court* (1909), *The Life of Christian of Denmark* (1913).

ADYE, ā'dī, Sir JOHN MILLER (1819-1900). An English soldier. He was educated at the Royal Military Academy, Woolwich, entered the Royal Artillery in 1836, and was Assistant Adjutant-General of the Royal Artillery in the Crimean War. He also served during the Indian mutiny in several important actions and in various other Indian campaigns. He was Director-General of Artillery from 1870 to 1875, and from 1875 to 1880 Governor of the Royal

Military Academy at Woolwich. He was promoted in 1879 to be Lieutenant-General, and in 1882 was Chief-of-Staff of the expedition to Egypt. He was Governor of Gibraltar from 1883 to 1886, when he retired from active service. He published *The Defense of Cawnpore* (1858); *Sitana: a Mountain Campaign; On the Borders of Afghanistan in 1863* (1867); *Recollections of a Military Life* (London, 1895); and *Indian Frontier Policy* (1897).

AD'YTUM (Lat. from Gk. ἄδυτον, *adyton*, the innermost sanctuary, from ἀ, *a*, priv. + δύνειν, *dyein*, to enter). The most sacred part of a building, usually associated with secrecy and darkness, because in Greek and Egyptian temples, with which the term originated, it designated a furthestmost recess not accessible to the people. See TEMPLE.

ADZE. See AXE.

ÆACIDES, ē-ās'i-dēs (Gk. Αἰακίδης, *Aiakidēs*). A patronymic of Achilles, as the descendant of Æacus, his grandfather.

ÆACUS, ē-ā-kūs (Gk. Αἶακος, *Aiakos*). The fabled son of Zeus and Ægina, and King of Ægina; the father of Telamon and Peleus. He was so renowned for justice that not only men but the gods sought his decisions. After death Pluto made him one of the judges in Hades.

ÆEBY, or **ÄBY**, ě'bě, CHRISTOPH THEODOR (1835-85). A Swiss anatomist and anthropologist, born near Pfalzburg, Lorraine. He studied medicine at Basel and Göttingen. In 1863 he was made professor of anatomy at Bern, and in 1884 at the University at Prague. He is best known for his contributions to anthropology, which include a new and valuable craniometric method. He also demonstrated the influence of atmospheric pressure on the several joints of the human body. His published works include *Untersuchungen über die Fortpflanzungsgeschwindigkeit der Reizung in der quergestreiften Muskelfaser* (Brunswick, 1862); *Eine neue Methode zur Bestimmung der Schädelform von Menschen und Säugetieren* (Brunswick, 1862); *Die Schädel formen des Menschen und der Affen* (Leipzig, 1867); *Ueber das Verhältnis der Mikrocephalie zum Atavismus* (Stuttgart, 1878).

ÆCIDIOMYCE'TES, ē-sīd'i-ō-mī-sē'tēz (*æcidium*, see below + Gk. nom. pl. μύκητες, *mykētes*, mushrooms, fungi). A group name formerly used to include the "smuts" and "rusts," and referring to the appearance of an "æcidium" in the life history of many rusts. See UREDINALES.

ÆCID'IUM (dimin. of Gk. αἰκία, *aikia*, injury), or CLUSTER CUP. One form of spore cluster ("sorus") of the parasitic fungi called "rusts." See UREDINALES.

ÆDIC'ULA (Lat., a small building, dimin. of *ædes*, building). In Roman literature, a designation for a small house or for part of a house; in modern usage, applied to chapels, shrines, or free-standing niches containing statues, and to sepulchral monuments in the form of little temples or chambers. In the large temples this name was given to architectural apses or niches containing statues, and even to little portable models given as votive offerings. During the Middle Ages the founders of churches were often represented in sculptures or paintings holding the model of the church; such models were termed "ædiculæ." The term may also be used to designate almost any small structure of a decorative or votive character.

ÆDILES, ē'dilz. In ancient Rome, a sort of commissioners of public works, with general

supervision over the public buildings (*ædes*), the cleansing and paving of the streets, the public games and spectacles, the water-supply, the inspection of weights and measures, and the market regulations. In connection with the public games, baths, taverns, and the like they had also police duties. At first, from 494 B.C., there were only two ædiles, both plebeians, elected by the plebs; their name, Ædiles Cereales, was derived from their headquarters, the Ædes Cereris. Afterward, two others, styled Ædiles Curules, were chosen at first from the patricians (366 B.C.), but later in alternate years from the patricians and the plebeians. Julius Cæsar appointed a new order of Ædiles Cereales to take charge of the public granaries. See A. H. J. Greenridge, *Roman Public Life* (1901); J. E. Granrud, *Roman Constitutional History* (1902); F. F. Abbott, *Roman Political Institutions* (1901); Botsford, *The Roman Assemblies* (New York, 1909).

ÆDUI, or **HÆDUI**, ěd'û-ī or hed'û-ī. A people of Gaul, between the Saône and the Loire, the first Gallic tribe that formed an alliance with the Romans, who therefore called them "Brothers of the Roman People" (Cæsar, *B. G.*, i, 33). Their chief town was Bibracte (Mont-Beuvray), which they later abandoned for Augustodunum (Autun).

ÆGA'DIAN ISLANDS (ancient ÆGA'TES). A group of three small islands situated directly off the west coast of Sicily and forming a part of the Italian province of Trapani (Map: Italy, G 10). They consist of the islands of Favignana, the largest and best populated of the group, Maritimo, and Levanzo. The total area is about 16 square miles. The island of Favignana is very fertile and has good tunny fisheries. The population of the group is about 6000, of whom nearly 5000 are found on the island of Favignana. In 241 B.C. the Romans, under Lutatius Catulus, achieved a great naval victory over the Carthaginians off these islands, which brought the first Punic War to a close. The islands belonged to the Pallavicini family of Genoa from the middle of the seventeenth century until 1874.

ÆGÆON, ê-jě'ōn (Gk. *Αἰγαίων*, *Aigaiōn*). In Greek mythology, the name by which, according to the *Iliad*, i, 403, Briareus (q.v.) was known among men.

ÆGA'TES, or **ÆGA'TES IN'SULÆ**. See ÆGADIAN ISLANDS.

ÆGA'TIAN ISLANDS. See ÆGADIAN ISLANDS.

ÆGEEAN ISLANDS. The islands of the Ægean Sea (see ARCHIPELAGO). They comprise the following: Thasos, in the extreme north, off the Macedonian coast; Samothrace, Imbros, and Lemnos, near the Dardanelles; Eubœa, the largest of all, lying close along the east coast of the Greek peninsula; the northern Sporades, including Skiathos, Skopelos, and Skyros, near Eubœa; Lesbos, Chios, Samos, and the large group of other Sporades, such as Rhodes, Cos, and Patmos, adjacent to the coast of Asia Minor; and, finally, the large group, the Cyclades, extending southward from Eubœa toward Crete and including Andros, Delos, Naxos, Paros, and Melos. The islands are of volcanic origin, have a healthful climate and beautiful scenery, and are peopled mainly by Greeks. In ancient times they played a conspicuous part in the course of Greek history, giving to the world poets and philosophers. In the fifteenth and sixteenth centuries all the islands passed under Turk-

ish dominion. In 1832 Eubœa, the northern Sporades, and the Cyclades were united with the independent Greek kingdom, and in 1835 Samos, while remaining under Turkish suzerainty, was erected into an autonomous principality under the joint protection of France, Great Britain, and Russia. In the course of the Turco-Italian War of 1911-12 (q.v.) the Italians seized 12 of the Sporades, including Rhodes and Patmos, but promised by the Treaty of Lausanne (Oct. 15, 1912) to surrender them on condition that the Porte should accord effective reforms to the Christian inhabitants. During the Balkan War of 1912-13 (q.v.) the Greeks occupied all the Turkish islands in the Ægean except those held by the Italians. The Treaty of London (May 30, 1913) left the final disposition of the islands in the hands of the European Powers. For a more detailed description, see CYCLADES; SPORADES; and individual islands.

ÆGE'AN SEA. See ARCHIPELAGO.

ÆGE'ON. In Shakespeare's *Comedy of Errors* (q.v.), the merchant of Syracuse.

Æ'GERI'IDÆ. A family of moths. See CLEARWING.

ÆGEUS, ē'jūs or ē'jě-ūs (Gk. *Αἰγέως*, *Aigeus*). King of Athens, son of Pandion. He was the father of Theseus (q.v.) and by the latter was restored to the throne of Athens, of which he had been deprived by his brother Pallas. When Theseus set out for Crete to deliver his country from the tribute of Athenian lads and lasses it had to pay Minos (q.v.) for the Minotaur (q.v.), he put black sails on his funeral ship, but agreed in case he conquered the Minotaur to exchange these black sails for white. On approaching the coast of Attica he forgot his promise, and Ægeus, believing his son lost, threw himself into the sea, which, according to tradition, was named "Ægean" after him. Ægeus is supposed to have introduced the worship of Aphrodite into Athens, where he himself was honored with a *herōōn*, or shrine.

ÆGIDI, ā-gě'dě, LUDWIG KARL (1825-1901). A German jurist, politician, and author, born at Tilsit and educated at the universities of Königsberg, Berlin, and Heidelberg. He was editor of the *Konstitutionelle Zeitung* until January, 1851, and extraordinary professor at Erlangen from 1857 to 1859. During the Italian war he published, while in the service of the Russian ministry, the famous anti-Austrian pamphlet entitled *Preussen und der Friede von Villafranca* (1859), which was followed by *Suum Cuique: Denkschrift über Preussen* (1859) and *Der deutsche Kern der italienischen Frage*. Afterward he was a professor at the universities of Hamburg, Bonn, and Berlin, and served as a member of the Prussian Chamber of Deputies (1867-68, 1873-93), and as Councilor of Legation in the Foreign Office. He published numerous writings, among which the following is perhaps the most important: *Das Staatsarchiv, Sammlung der officiellen Aktenstücke zur Geschichte der Gegenwart* (in collaboration with Klauhold, Hamburg, 1861-71; afterward continued by Hans Delbrück, and since 1894 by G. Roloff).

ÆGIDIUS, ê-jid'ī-ūs. See GILES, SAINT.

ÆGI'NA (Gk. *Αἴγινα*, *Aigina*). Now EGINA. An island forming part of the kingdom of Greece, about 33 square miles in extent, in the ancient Saronic Sinus, now the Gulf of Ægina, between Argolis and Attica. It is mountainous, with deep valleys and chasms, and the coast af-

fords only one haven, on the northwest. The modern town of Egina stands on the site of the ancient town, at the northwest end of the island. The island contains about 8200 inhabitants, who are chiefly occupied in trade, navigation, and agriculture. The soil produces the best almonds in Greece, with wine, oil, grain, and various fruits. An ancient legend derived the name of the island from the nymph Ægina, daughter of the river god Æsopus, who was brought to it by Zeus, by whom she became the mother of Æacus, famed for his justice. The ancient Achæan population was driven out by Dorians from Epidaurus, who built up one of the richest trading cities in Greece. It was said that money was minted first on Ægina. The Æginetans took a prominent part in the defeat of the Persians at Salamis, but with the growth of the Athenian power they were first forced to become tributary to Athens and in 431 B.C. were expelled from the island. They were later restored by Lysander, but the island never recovered its old position. See ÆACUS; ÆGINETAN SCULPTURES; TALENT.

ÆGINA, or **AIGINA**, GULF OF (the ancient SARONIC GULF). An arm of the Ægean Sea, between the Peloponnesus and Attica, and separated from the Gulf of Corinth by the Isthmus of Corinth (Map: Greece, D 6). In the Gulf of Ægina are the islands of Salamis and Ægina.

ÆGINETA, ěj'i-nĕ'tā, PAULUS (Gk. Παῦλος) (latter half of seventh century, A.D.). A Greek physician, born in the island of Ægina, from which he took his name. Of the details of his life little is known, save that he was a great traveler; his medical works were highly prized, though they were little more than compilations from earlier writers. The chief of these is still extant, *De Re Medica Libri Septem*, last edited by Briau (Paris, 1855). This work was translated into Arabic; there is an English version by Adams (London, 1834). See Krumbacher, *Byzantinische Litteraturgeschichte*, pp. 614, 616 (Munich, 1897).

ÆGINE'TAN SCULP'TURES. The small island of Ægina holds an important position in the history of early Grecian art, as the seat of a famous school of bronze workers, whose

which indicate that the temple was not dedicated to Athena, as had been believed, but to an Æginetan goddess, Aphæa, of whom little is otherwise known; her name appears in full on two inscriptions, in part on two others, all found within the sanctuary. By some scholars, however, the ascription of the temple to Aphæa is still questioned. The temple was built in the earlier part of the fifth century B.C. New fragments of the pedimental sculptures were found, which throw light on the groups represented in the pediments. The statues in the pediments are somewhat under life size. In the centre of each pediment stood Athena, with groups of fighting warriors about her. It is probable that in the eastern pediment was represented the Trojan expedition of Hercules, in the other that of Agamemnon. In both pediments the figures were symmetrically arranged. These sculptures are among the best works of archaic Greek art, of which they were for a long time almost the only examples. The figures are carefully modeled, and the anatomy is in general good, but the treatment is somewhat dry and hard, in spite of an evident effort to give a realistic character to the groups. The sculptures of the eastern pediment show a decided superiority in this respect, and in particular have nearly lost the "archaic smile" which appears in the companion group. Both groups testify to the high quality of Æginetan art as early as 480 B.C. For an account of the excavations consult Cockerell, *The Temples of Ægina and Bassæ* (London, 1860), and more especially, Furtwängler, *Ægina. Das Heiligthum der Aphæa* (1906). For a convenient discussion of the latter book, see *American Journal of Philology*, xxviii, 329-335. For an account of the sculptures, see Furtwängler, *Kurze Beschreibung der Glyptothek* (Munich, 1900), *Sitzungsberichte der Bayerischen Akademie* (1901), and *Ægina. Das Heiligthum der Aphaia* (1906). For illustrations, see Furtwängler, *Ein Hundert Tafeln nach den Bildwerken der Kgl. Glyptothek zu München* (1903).

ÆGIR, ě'jir or â'jir. A Norse deity who presides over stormy oceans and entertains the gods with foaming ale. His wife is Ran, who tries to



WESTERN PEDIMENT OF THE TEMPLE OF PALLAS AT ÆGINA.

most celebrated artist was Onatas (about 490-460 B.C.). The school was especially noted for its statues of athletes and seems to be connected with the Peloponnesian art. On an eminence in the northeastern part of the island stand the ruins of a temple, where in 1811 excavations conducted by Cockerell, von Haller, Foster, and Linckh brought to light fragments of sculpture, which were bought by the Crown Prince, Louis of Bavaria, and, after restoration (not always correct) by Thorwaldsen, set up in the Glyptothek at Munich. In 1901 Prof. A. Furtwängler began new excavations on this site in behalf of the Prince Regent of Bavaria. These excavations have yielded a number of important fragments of the pediment sculptures, as well as of other statues and some inscriptions, four of

catch voyagers in her net and wreck their ships. They have nine daughters, the waves of the sea, whose names suggest the different appearances of the ocean.

Æ'GIS (Gk. αἴγῖς, *aigis*, a rushing storm, from ἀίσσειν, *aïssein*, to move violently, or αἴγῖς, *aigis*, a goat-skin). In the Greek epic, sometimes the shield of Zeus, which had been fashioned by Hephæstus, sometimes the whirlwind that drives the storm-cloud, ascribed to Zeus as his shield because he was god of the weather. Later writers explained it as the skin of the goat Amalthea (q.v.), which had suckled Zeus, with the Gorgon's head in the centre. (See GORGO.) In works of art it is sometimes borne by Zeus and is a regular attribute of Athena.

ÆGIS'THUS (Gk. Αἰγισθος, *Aigisthos*). The

son of Thyestes and adopted son of Atreus. During the absence of Agamemnon at Troy he seduced Clytemnestra, wife of Agamemnon, and helped her murder Agamemnon after the latter returned from Troy. Ægisthus was subsequently killed by Agamemnon's son Orestes. The story forms the subject of the Oresteian trilogy of Æschylus. See ÆSCHYLUS; ATREUS; AGAMEMNON; CLYTEMNESTRA; ORESTES.

ÆGIUM (Gk. Αἴγιον, *Aigion*). A town of Achaia, near the coast, west of the mouth of the Selinus River. According to one legend it was the birthplace of Zeus, who was the principal divinity of the place. After the destruction of Helice, Ægium became the chief city of the Achæan League (see ACHÆA), and the delegates of the league had their place of meeting in a grove near the town. The modern town is Vostitza, but it is officially called by its ancient name.

ÆGLE, ē'glê (Gk. Αἴγλη, *Aiglê*, Radiance, a Greek divinity). A genus of two or three species belonging to the family Rutaceæ, very nearly related to *Citrus* (lemon, orange, etc.), from which it is distinguished by the gourd-like rind of the fruit and the woolly seeds. *Ægle marmelos*, of tropical Asia, is the tree whose fruit is called "elephant apple," "Bengal quince," "bhel fruit," etc. The fruit is delicious, fragrant, and nutritious. In an imperfectly ripened state it is an astringent of great effect in cases of diarrhœa and dysentery, and as such has lately been introduced into English medical practice. The root, bark, and leaves are also used as medicinals. The Dutch in Ceylon prepare a perfume from the rind of the fruit, and the mucus of the seed is employed as a cement for many purposes.

ÆGOSPOTAMI. See ÆGOSPOTAMOS.

Æ'GOSPOT'AMOS (Gk. Αἴγός, *Aigos*, gen. of αἶξ, *aix*, goat + ποταμός, *potamos*, river). A river and town on the eastern coast of the Thracian Chersonese. (See CHERSONESUS.) The Lacedæmonians under Lysander here surprised and captured the Athenian fleet in 405 B.C., and thus brought the Peloponnesian war to an end. The name is also written Ægospotami. The ancient town was near the modern village of Jumaliköi.

ÆGYPTUS (Gk. Αἴγυπτος, *Aigyptos*). In Greek legend, a brother of Danaüs and King of Arabia, who conquered the region to which he gave the name of Egypt. His 50 sons followed their 50 cousins, the daughters of Danaüs, to Argos and married them; on the wedding night all, with the exception of Lynceus, were murdered by their brides. See ÆSCHYLUS (in the account of "The Suppliants"); DANAUS; EGYPT.

ÆHRENTHAL, â'ren-täl, ALOIS LEXA, COUNT VON (1854-1912). An Austro-Hungarian statesman. He was born Sept. 27, 1854, and was educated at the universities of Bonn and Prague. In 1877 he entered the diplomatic service, and after occupying subordinate positions in the Austro-Hungarian embassies in Paris and St. Petersburg and in the Foreign Office in Vienna he was, in 1888, appointed Minister to Rumania. He showed such skill in diplomacy that in the following year he was given the important post of Ambassador to Russia. After serving in St. Petersburg until 1906 he was in that year appointed Premier and Minister of Foreign Affairs. His influence in European affairs soon began to be felt. Before two years had passed Austria had, largely through his efforts, and in the face of strong opposition in the European

capitals, annexed the Turkish provinces of Bosnia and Herzegovina (q.v.), which, since the Treaty of Berlin in 1878, had been under an Austrian protectorate. The seizure of these provinces was said to be the conception of the Archduke Franz Ferdinand, the heir-apparent, and he found a strong and skillful ally in Von Aehrenthal. In 1910, however, the latter broke away from the aggressive party in Austrian politics and placed himself at the head of the peace party, insisting especially on a pacific attitude toward Italy, which was then on the verge of the war with Turkey for the possession of Tripoli. Franz Ferdinand became bitterly offended with Von Aehrenthal. The quarrel between the two was laid before the Emperor Franz Joseph for adjudication, and the Premier placed his resignation in the Emperor's hands. The latter gave unqualified support to the peace policy, and this marked a great triumph for Von Aehrenthal. It was, however, his last success. His health already had been broken, and the strain of his struggle with the Archduke completed the wreck. He died Feb. 17, 1912. See AUSTRIA-HUNGARY.

ÆLFRIC (äl'frik) **THE GRAMMA'RIAN** (c.950-c.1021). The author of some of the best Old English prose extant. The only material—and it is slight—for constructing the life of this scholar is contained in his own works. The place of his birth is unknown, but the date of it must have been somewhere between 950 and 955. After studying with a poorly educated "mass-priest," he entered the Benedictine school at Winchester (about 972), where he remained "many years." In 987, then "a monk and mass-priest," he was summoned to rule over the abbey of Cernel in Dorset. There he was engaged in preaching and in giving instruction to monks and to young men. Afterward, probably in 1006, he was made abbot of Eynsham, in the valley of the Thames above Oxford. It is conjectured that he died between 1020 and 1025. Ælfric is best known by his *Homilies*, written in pure and vigorous English. Among his other works are *A Treatise on the Old and New Testaments*, the *Heptateuchus*, an abridged translation of the first seven books of the Old Testament, a Latin grammar and glossary, written in English for the boys of England, and the *Colloquium*, which was designed to teach them to speak Latin correctly. Because of these last two books he is accorded the title of grammarian. For the best account of Ælfric and a bibliography of his works and of critical editions, consult C. L. White, *Ælfric*, a new study of his life and writings, in *Yale Studies in English* (Boston, 1898); Westlake, in *Cambridge History of English Literature*, vol. i (1907); Gem, *An Anglo-Saxon Abbot, Ælfric of Eynsham* (Edinburgh, 1912).

ÆLFTHRYTH, älf'thrith (Latinized *Elfrida*) (c.945-1000). An Anglo-Saxon queen, mother of Æthelred II. Her first husband was Æthelwald, the ealdorman of the East Anglians, and after his death she married King Eadgar, the father of Æthelred II. She is said to have instigated the murder of her stepson, Eadward, at Corfe, in order to secure the accession of Æthelred II. Consult Erich Schmidt, *Elfridedramen* (1886).

ÆLIA CAP'ITOLI'NA. The name given to Jerusalem by the Emperor Hadrian (Ælius Hadrianus), who expelled the Jews after the insurrection of 132-135 A.D. and colonized the

city with Romans. The name continued until the time of the Christian emperors.

ÆLIA GENS. One of the plebeian gentes (see GENS) at Rome, to which belonged Ælius Sejanus, and the emperors Hadrian and the Antonines. It included also, among others, the families of Gallus, Lamia, Pætus, and Tubero.

ÆLIA LÆLIA CRISPIS. The subject of a very celebrated enigmatical inscription preserved at Bologna. It has been puzzled over by many learned men, but never solved. The inscription begins:

Ælia Lælia Crispis,
Nec vir, nec mulier, nec androgyna;
Nec puella, nec iuvenis, nec anus;
Nec meretrix, nec pudica;
Sed omnia. . . .

'Ælia Lælia Crispis,
Neither man, nor woman, nor hermaphrodite;
Neither girl, nor youth, nor grandmother;
Neither vicious nor virtuous
But all [of them].' . . .

ÆLIA'NUS, CLAUDIUS. A writer who was born at Præneste in Italy and flourished in the latter part of the second century A.D. He wrote exclusively in Greek in an entertaining fashion, but the information contained in his writings was drawn most uncritically from the works of his predecessors. His extant writings are *On the Nature of Animals*, in 17 books, filled with curious accounts of the nature and ways of animals, and with moral reflections on the same, very valuable for its many excerpts from earlier writers, and his *Miscellanies* (*Varia Historia*), in 14 books. The latter is preserved only in an abbreviated form, and is almost wholly a collection of anecdotes and marvelous tales relating to men. The 20 *Rustic Letters* current under his name are generally reckoned spurious. His works are best edited by Hercher (1858 and 1864); the best annotated edition is by Schneider (1784). The editions of the *Varia Historia*, by Perizonius (1701), and *De Animalium Natura*, by Jacobs (1831), also deserve mention.

ÆLIANUS TACTICUS (Ἀλιανὸς Τακτικός). A Greek writer, who, about 106 A.D., wrote a work entitled *Τακτικὴ θεωρία*, *Taktikē Theōria*, 'Review of Tactics,' a treatise on Greek (Macedonian) military tactics as practiced by the successors of Alexander the Great. The work has great value, not merely for its detailed account of matters of drill and tactics, but also because Ælianus gives a careful account of the writings of his predecessors in this field. Chief among his sources was Polybius (q.v.). Ælianus's work enjoyed a high reputation; it was much used by the Byzantines, and about 1350 was translated into Arabic. In the sixteenth and the seventeenth centuries it was closely studied by professional soldiers, and much of its material was incorporated in works on tactics. It was translated into Latin by Theodore Gaza (see *Veteres De Re Militari Scriptores*, Venice, 1847); into French, by Machault, in *Milices des Grecs et Romains* (Paris, 1615); into German, on the basis of Gaza's rendering (Cologne, 1524); into English, by Bingham (London, 1616) and by Viscount Dillon (London, 1814). The text was edited, with translation, notes, and reproductions of the original illustrations, by Rüstow and Köchly, in *Griechische Kriegsschriftsteller* (Leipzig, 1855). Consult Rüstow and Köchly, *Geschichte des Griechischen Kriegswesens* (1882); P. Serre, *Etudes sur l'histoire militaire et mari-*

time des Grecs et des Romains (1887); A. de Lort-Sérignan, *La Phalange* (1880).

ÆLLO, ā-ēl'ō (Gk. ἄελλω, storm-swift, from ἄελλα, *aëlla*, whirlwind). In Greek mythology, the name of one of the Harpies (q.v.).

ÆLRED, āl'rēd, SAINT, **AILRED**, **ETHELRED** (1109-66). An English ecclesiastic and historian, born at Hexham, Northumberland. He was educated at the Scotch court, became a Cistercian monk in Rievaulx Abbey, Yorkshire, then abbot of Revesby (1142), then of Rievaulx (1146), remaining so till his death, Jan. 12, 1166. He was canonized in 1191. He was the author of many historical and theological works, the former of little value owing to their unlimited credulity. Leland says he saw Ælred's tomb at Rievaulx adorned with gold and silver ornaments. His works are in Migne, *Patrol. Lat.*, vol. cxcv.

ÆLST. See ALOST.

ÆLST, älst, **WILLEM VAN** (1626-83). A Dutch painter of still life. He was born in Delft and studied with his uncle Evert van Aelst. He passed four years in France and seven in Italy, where he attained great reputation and was known as Guglielmo d'Olanda. He finally settled and practiced at Amsterdam, devoting himself to game, fish, fruits, and flowers and employing crystal and porcelain vessels, the surfaces of which he painted with rare skill. Two of his paintings are in the Museum at The Hague, others are at Dresden, Munich, Copenhagen, and Karlsruhe. His uncle **EVERT VAN ÆLST** (1602-58) painted in a more detailed and careful manner, but with less excellence. His work is very rare.

ÆLUROIDEA, ē'lū-roi'dē-ā. See CARNIVORA.

ÆMIL'IA. A division of Italy. See EMILIA.

ÆMIL'IA GENS. A famous patrician gens at Rome (see GENS), to which belonged the family of Æmilius Lepidus, Mamercus, Paulus, Scaurus, and other well-known men.

ÆMIL'IAN WAY (Lat. *Æmilia Via*). A national highway in ancient Italy. It was built by the consul Marcus Æmilius Lepidus, in 187 B.C., to afford easy communication with Transpadane Gaul, as a part of the great centralizing schemes of Rome in her imperial march northward. It began at Ariminum (Rimini) by the Adriatic Sea, where the Flaminian Way terminated, and ran through Bononia (Bologna) to Mutina (Modena) and Parma, crossed the Po at Placentia (Piacenza), and ended at Mediolanum (Milan). Its total length was about 185 miles.

ÆMILIA VIA. See ÆMILIAN WAY.

ÆMIL'IUS PAULUS (second century B.C.). A Roman general, son of the consul Æmilius Paulus, who fell in the battle of Cannæ, 216 B.C. He inherited his father's valor and enjoyed an unwonted degree of public esteem and confidence. In 168 B.C. he was elected consul for the second time, and intrusted with the war against Perseus, King of Macedon, whom he defeated in the battle of Pydna, which left Macedonia a Roman province. Henceforth he was known as Æmilius Paulus Macedonicus. See AGNOMEN.

ÆNE'AS (Gk. Αἰνείας, *Aineias*). The hero of Vergil's *Æneid*. He was, according to Homer, the son of Anchises and Aphrodite (Venus) and was ranked next to Hector among the Trojan heroes. The traditions of his adventures before and after the fall of Troy are various and discordant. Vergil (q.v.) gives the following version: Æneas, though warned by the ghost of Hector in the night when the Greeks entered

Troy to take his household gods and flee from the city, remained in the contest until Priam fell, when, taking with him his family, he escaped from the Greeks to Mount Ida, near Troy, but in the confusion of his hasty flight lost his wife, Creüsa. Having collected a fleet of 20 vessels, he sailed to Thrace, where he began building the city of Ænos, but, terrified by an unfavorable omen, he abandoned his plan of a settlement there. A mistaken interpretation of an oracle of Delphi now led him to Crete, but from this place he was driven by a pestilence. Entering the Adriatic, he passed the promontory of Actium and came to Epirus. Later, he retraced his course and continued his voyage to Italy and round Sicily to the promontory of Drepanum on the west of the island, where his father, Anchises, died. When he set out again for Italy, a storm drove him to the coast of Africa. Landing near Carthage, he was hospitably received and entertained by Queen Dido. His sojourn with Dido was cut short by Jupiter, who sent Mercury with a command to Æneas to proceed to Italy. Accordingly, he sailed away to Sicily again, leaving the disappointed Queen, who committed suicide. During this stay in Sicily, while he was celebrating with games the anniversary of his father's death, the wives of his companions and seamen, weary of long voyages without certainty of finding a home, made an attempt to burn his fleet; four vessels were in fact burned. To provide for those for whom he had no room now in his ships and for others who were unwilling to journey farther he built in Sicily the city of Acesta and then sailed for Italy. On landing there, near Cumæ, he visited the Sibyl at Cumæ. She conducted him into the infernal regions, where he saw Anchises and received intimations of his future destiny and of the history of the Roman race. Then, sailing along the coast of Italy, he soon landed at the mouth of the Tiber and found himself in the country of Latinus, King of the Aborigines (q.v.). Lavinia, the daughter of Latinus, had been destined by the oracles to marry a stranger, but her mother had promised to give her in marriage to Turnus (q.v.), King of the Rutuli. She married Æneas, and war ensued, which terminated in the death of Turnus. Æneas Silvius, the son of Æneas by Lavinia, as the ancestor of the kings of Alba Longa, and hence of Romulus and Remus, was regarded as the founder of the Roman State. See H. Nettleship, "The Story of Æneas' Wanderings," in Conington's edition of *Vergil*, vol. ii; and Gaston Boissier in *Revue des deux Mondes* (1883). See ROME.

ÆNEAS SILVIUS. See PIUS II.

ÆNEAS TACTICUS (*Αἰνέας Τακτικός*). A Greek, who, according to Ælianus Tacticus (q.v.) and Polybius (q.v.), was among the first to write on the art of war. We still have a short Greek work, written about the middle of the fourth century B.C., which deals with the attack and the defense of strongholds. A superscription in the manuscripts ascribes this book to "Æneas or Ælianus." Casaubon (q.v.), who first edited the text, in 1609, as an appendix to his edition of Polybius, disregarded, on chronological grounds, the reference to Ælianus, and ascribed the work to the Æneas mentioned by Polybius. This Æneas he identified with Æneas of Stymphalus, in Arcadia, a general mentioned by Xenophon as fighting at Mantinea (362 B.C.). This identification has been generally accepted. But in

1904 T. Hudson Williams, in the *American Journal of Philology*, vol. xxv, not only challenged this identification, but held that the treatise cannot have been written by the Æneas named by Polybius. The work is of great value and interest, full of anecdotes, and enriched by illustrations from Thucydides and Xenophon. The text has been edited by Hercher (Berlin, 1870), and, with elaborate prologomena, by Hug (Leipzig, 1874). Consult: Beausobre, *Commentaires sur la défense des places d'Æneas* (Amsterdam, 1757); Rüstow and Köchly, *Griechische Kriegsschriftsteller*, vol. i (Leipzig, 1853); Lange, *De Æneæ Commentario Poliorcetico* (Berlin, 1879); and the bibliography attached to Williams's paper, referred to above.

ÆNEID (Lat. *Æneis*). Vergil's great epic, in which he tells the story of the Trojan Æneas (q.v.), founder of the Roman race. See VERGIL.

ÆNESIDEMUS, ē'nēs-ī-dē'mūs (Gk. *Αἰνῆσιδῆμος*, *Ainēsidēmos*) (?80-60 B.C.). A Greek philosopher of Alexandria, a contemporary of Cicero. He was born at Cnossus, in Crete. He is well known as the probable author of *Pyrrhonian Principles*, the first part of which deals with the *Ten Tropes*, which Sextus Empiricus enumerates, saying that they had become traditional property of the skeptics (q.v.) of his day. Tropes (Gk. *τρόποι*, *tropoi*) are methods of proving the validity of skepticism. These arguments are based (1) on differences in the constitution of sentient beings, which involve differences in perceptions and conceptions of the world; (2) on differences of human beings; (3) on differences of sense-organs; (4) on differences in circumstances under which perception occurs; (5) on differences of location and distance of objects perceived; (6) on the confusion of one object with another; (7) on differences in a sensation due to different combinations in which it appears; (8) on the relativity of knowledge in general; (9) on differences in perception due to familiarity or unfamiliarity with the object; (10) on differences observed between the civilizations, morals, laws, superstitions, and philosophical theories of different peoples. The second part of Ænesidemus's above-named work contained an attack upon the principle of causality and on the attempt to attain truth, the latter being shown to be variable. His argument against causality is that it exists only in the mind that perceives, for the reason that the external relation between cause and effect is inconceivable. Two things are either simultaneous or successive, and, if simultaneous, causality is inoperative; if successive, cause must precede effect, and a moment of time is to be supposed when cause does not effect anything or virtually is non-existent. The latter part of his book disposes of morality and all good. He is the prototype of the skeptic attitude of mind. Consult E. E. Saisset, *Le scepticisme* (Paris, 1865); Schultze, *Ænesidemus* (Berlin, 1911). See RELATIVITY, LAW OF.

ÆNIA'NES. An Achæan tribe of Thessaly, in northern Greece. In historic times they lived in the mountains west of Thermopylæ. They were members of the Delphian Amphictyony and of the Ætolian League. See AMPHICTYONIC COUNCIL; ÆTOLIA.

ÆNOBARBUS (Lat. *æneus*, bronze, *barba*, beard, bronze-beard). A cognomen (q.v.) borne by some members of the Domitia Gens (q.v.).

ÆNON (explained in the New Testament as

“many springs”). A locality mentioned in John iii. 23 as a place where John the Baptist was baptizing. It is characterized as being “near Salim” and as having an abundant water supply. Three sites have been proposed as complying with this description: (1) A town called Ainun, in the valley that leads up toward Shechem, about 7 miles from the ancient town of Salem, where there are extensive ruins and many springs; (2) on the basis of statements in Eusebius and Jerome, a place called Silvia (= Salem?), about 8 Roman miles south of Scythopolis, the old Bethshean; (3) a spot in the *Wady Fâr'ah*, some 6 miles northeast of Jerusalem, containing beautiful pools of water, within 2 miles of which is another valley called by the Arabs *Wady Saleim*. The last identification seems the best, in so far as it locates the place of the Baptist's ministry in Judæa rather than in Samaria.

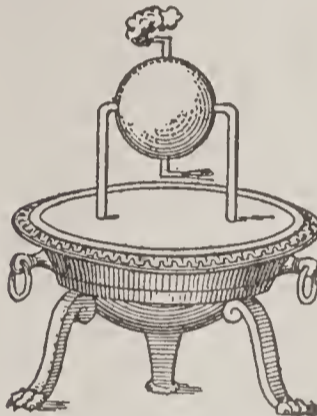
ÆOLIAN ACCUMULATIONS (from *Æolus*, the god of the winds). Dust, fine particles of soil, and even sand grains of a diameter of two millimeters are transported by the wind and brought together in sheltered places, in much the same manner as these particles are transported and deposited by water. Such æolian accumulations occur in both humid and arid regions, though they attain a more pronounced degree of development in those regions of little rainfall, where the scant vegetation permits the usually powerful winds to exert a considerable erosive action upon the much weathered rocks and dry soil. In humid regions deposits of this nature may be found along the coasts of seas and ocean and also upon upland plains, where the superficial layers of the earth's crust consist of loose sand that may be easily blown away, to be accumulated elsewhere as sand-dunes. In arid regions, dust and sand are being continually transported and deposited in distant places, there to form æolian deposits which are often of considerable geological and also of economic importance. Desert sands traverse wide areas, burying vegetation that may be in the way, even sometimes destroying forests. On the other hand, the fine calcareous dust blown over the prairies of the West settles in the grass and adds to the fertile covering of soil. The fertility of many regions of the Missouri valley is undoubtedly due to these wind-deposited soils, which are known under the name of “loess”; some of the loess is, however, of aqueous origin. Æolian accumulations have been recognized also in ancient rock formations of various geological systems, notably the Cambrian, Devonian, Jurassic, etc. For description of the erosive and transporting power of wind, and for the characters and distribution of the various kinds of æolian deposits, see the articles on **DESERT**; **DUNE**; **SAND**; **WIND**; and **GEOLOGY**, paragraph on *Wind Work*.

ÆOLIAN HARP. A musical instrument, consisting of a number (usually 8 or 10) of catgut strings of varying thickness tuned to produce the same fundamental tone and stretched over a narrow, oblong box. When placed in a current of air, the Æolian harp produces full chords, composed of the harmonies of the common fundamental. The sounds change from a breezy, fairy-like pianissimo to an imposing forte, which again dies away with the passing of the gust. For illustration, see **MUSICAL INSTRUMENTS**.

ÆOLIAN ISLES. See **LIPARI ISLANDS**.

ÆOL'LIANS (Gk. *Αἰολεῖς*, *Aioleis*). The name of one of the three great divisions of the Hellenic race, borne especially by the Greeks of the island of Lesbos (q.v.) and of the coast of Asia Minor north of Cyme and north of the Ionians (q.v.). Their territory was known as Æolis. They traced their descent to a mythical Æolus of Thessaly, son of Hellen (q.v.), the mythical common ancestor of the Greeks. Later writers extended the name so as to include all Greek races not Dorian or Ionian. It has been maintained that the stories of the *Iliad* originated among the Æolians. At the end of the seventh century B.C., among the Æolians, on the island of Lesbos, in the poems of Alcæus and Sappho, the personal lyric reached its highest development. The Æolians shared the fate of the other Grecian colonies in Asia Minor. First tributary to the Lydian kings, then subjected to the domination of the Persians, they became a portion of the great Empire founded by Alexander the Great, and, after passing through a stage of subjection to the dynasty of the Seleucidæ, were ultimately absorbed in the Roman Empire. See **ÆOLIS**; **ÆOLUS** (2); **HOMER**; **LYRIC POETRY**; **SAPPHO**.

ÆOL'PILE, or **ÆOL'IPYLE** (commonly explained as from Lat. *Æoli pila*, the ball of Æolus). An invention of Hero of Alexandria, often described as the first steam engine. It consists of a hollow metal sphere mounted on trunnions, through one of which steam is introduced. Short bent tubes issue from this ball at diametrically opposite points, from which steam escapes and causes the globe to revolve. A similar device can be used when the globe is filled with water or alcohol, as a blow-pipe for lamp flame. Consult: Gerland and Traumüller, *Geschichte der physikalischen Experimentierkunst* (Leipzig, 1899), for a description of this and other early apparatus; also W. Schmidt, *Heron von Alexandria* (Leipzig, 1899). It is also described in R. H. Thurston's *Growth of the Steam Engine* (New York, 1878).



HERO'S ÆOLIPILE.

ÆOLIS (Gk. *Αἰολίς*, *Aiolis*). A district on the west coast of Asia Minor, extending from the Hellespont to the river Hermus. There were about 30 Greek cities in this district, of which 12 in the southern part formed a league in early times. See **ÆOLIANS**.

ÆOLUS (Gk. *Αἰόλος*, *Aiolos*). 1. A friend of the gods and controller of the winds. In the *Odyssey* he rules a floating island. In the *Æneid* he keeps the winds confined in a cave and releases them as he wills, subject to laws imposed on him by Zeus. He was also supposed to dwell in a vast cave in the Æolian Isles (q.v.) north of Sicily, keeping the winds in bags and letting them out as demanded by Poseidon. 2. Son of Hellen (q.v.), brother of Dorus and father of Sisyphus. He ruled in Thessaly and is said to have been the founder of the Æolic branch of the Greek race.

Æ'ON (Gk. *αἰών*, *aiōn*, an age, long space of time, eternity). A term used by the Gnostics, in a peculiar sense, to designate powers that had emanated from God before the beginning of time and existed as distinct entities or spirits. They were called æons either as partaking of the eter-

nal existence of God or because they were thought to preside over the various ages and transformations of the world. See Gnostics.

ÆPINUS, ê-pī'nūs, or *Ger. pron.*, â'pē'nūs, FRANZ MARIA ULRICH THEODOR (1724-1802). A German physicist, born at Rostock. He first studied medicine, but afterward devoted himself to physics, of which he became professor in St. Petersburg in 1757. He discovered the electric properties of the mineral tourmaline, improved the microscope, and performed numerous original experiments in frictional electricity and magnetism, devising the method of magnetizing known as "double touch." He, in common with Benjamin Franklin, held the single fluid theory of electricity, in opposition to many men of his time who believed that there were two kinds of electricity. He published *Tentamen Theoriæ Electricitatis et Magnetismi* (1759). Catharine II, Empress of Russia, made him teacher to her son Paul and inspector-general of the normal schools which she proposed to establish.

ÆPYOR'NIS (Gk. *αίπυς*, *aipys*, high + *ὄρνις*, *ornis*, bird). An extinct group of ratite birds which inhabited Madagascar within recent but undetermined geological time, and 10 species of which are known from fossil remains; no evidence exists that it survived to the time of man, although it is frequently referred to as the "roc." It resembled an ostrich in general structure and appearance, but was perhaps taller, and had no wings suitable for flight, resembling in this respect its close, still living ally, Apteryx, and the extinct Dinornis and Megalapteryx, of New Zealand. Many of its huge eggs have been exhumed from the drifting sands of southern Madagascar. They measure about 9 by 13 inches, and are very large proportionately, since they are double the dimensions of ostrich eggs and much exceed those of the moa. For a circumstantial account of the collecting of its bones and eggs in Madagascar, see *Proceedings Zoological Society of London* (1894).

ÆQUI, ê'kwī, or **ÆQUICU'LI**. An ancient warlike tribe in the mountains of Central Italy, obstinate enemies of the early Romans, against whom they made alliances with the Volsci (q.v.). They were defeated by Camillus, 389 B.C., and in 304 B.C. were finally subdued. Mount Algidus was one of their strongholds, whence they made raids on Rome.

ÆRA'RIANS (Lat. *ærarii*, persons pertaining to the *ærarium*, 'the treasury,' i.e., paying taxes). A class in early Rome having no social position now definable and having no civil rights beyond the mere protection of the State. Here belonged the inhabitants of conquered towns which had been deprived of their local self-government. Since Cære was the first town to occupy such relation to Rome (about 353 B.C.), the terms *Cærites* and *ærarii* became synonymous. (See CERVETERI.) For bad conduct any citizen might be degraded to this condition, but not for life. Persons declared infamous became members of this class, and it probably included itinerant retail merchants. They were taxed, but were not subject to military service.

ÆRARIII. See ÆRARIANS.

ÆRA'RIVM (Lat., from *æs*, bronze, money). The public treasury of ancient Rome, containing the money and the accounts of the State, as well as other treasures such as the standards of the legions, the laws, graven on bronze tablets, decrees of the Senate, etc. The temple of Saturn,

at the foot of the Capitol, at the western end of the Forum (q.v.), was the place of deposit; hence this treasury was called *Ærarium Populi*, or *Ærarium Saturni*. Besides this common treasury, replenished by general taxes and charged with ordinary expenditures, there was in the same temple a reserve treasury, maintained by a tax of 5 per cent on the value of manumitted slaves, which was not to be resorted to or even entered except in extreme necessity. In addition to these treasuries, the property of the Roman people as represented by the Senate, the Emperor had a *fiscus*, or separate exchequer. To the *fiscus* went the revenues from those provinces which were assigned to the Emperor and from conquered territory, as well as from gifts by various towns in Italy and the provinces, etc. The chief charges against the *fiscus* were for the maintenance of the army and the navy, the administration of the provinces, the grain and water supply, and the care of the Tiber. Augustus established a military treasury to contain all money for the maintenance of the army; one source of revenue for this treasury was an inheritance tax of 5 per cent. Later emperors had separate private *ærariums*, containing the moneys appropriated to their private use.

AËRATED, ā'ēr-ā'tēd, **BREAD**. See BREAD.

AËRATED WATERS. Waters impregnated with carbon dioxide gas and frequently containing mineral salts. Such waters, extensively used to quench thirst, are commonly called soda waters, on account of the use of sodium bicarbonate in the original method of manufacture. Dr. Joseph Priestley (q.v.), the celebrated chemist, is credited with first producing publicly a glass of drinkable aërated soda water, and in 1806 the manufacture was undertaken in the United States, where the familiar soda-water fountain was developed. A few years later in Philadelphia the combination with fruit syrups was made popular. The carbonic acid used in making the common artificial aërated waters is prepared by treating a mineral carbonate, as chalk or lime-stone, with dilute sulphuric acid. The gas thus obtained is forced into bottles or siphons containing water, yielding a brisk, sparkling liquid with a pungent but pleasant acidulous taste. Artificial waters, similar to seltzers, vichy, and other well-known mineral waters, are produced by dissolving the known ingredients of the mineral water in distilled water and then impregnating them with carbon dioxide gas. The carbonic-acid water mixed with fruit syrups is the ordinary soda water of the pharmacy. Formerly carbonic-acid water was made on a small scale in an apparatus called a gazogene or seltzogene, in which sodium bicarbonate was decomposed by tartaric acid in the presence of water. A more recent invention was the use of capsules containing liquefied carbon dioxide. The liquid which it is desired to impregnate with the gas was placed in a specially constructed bottle, the top of which was provided with a receptacle for the capsule containing the liquefied gas; the covering of the capsule was then ruptured, setting free the acid, which was absorbed by the liquid in the bottle. Aërated waters may also be said to occur naturally, for water taken from a spring contains gases, such as oxygen, nitrogen, and carbon dioxide, dissolved in it. Similarly, running waters, such as rivers and rain waters, absorb gases

from the atmosphere, which may be expelled by boiling. Consult *A Treatise on Beverages*, by C. H. Sulz. See CARBONATED OR ACIDULOUS WATERS; MINERAL WATERS; SODA WATERS; also BOTTLING.

A'ËRA'TION (Lat. *aër*, air). In botany, the exchange of gases between living plant tis-

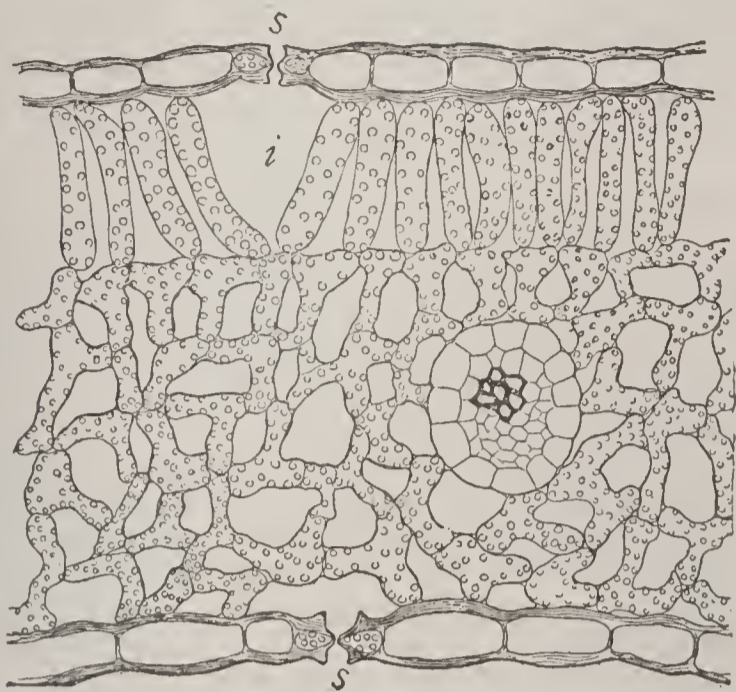


FIG. 1.

Diagrammatic cross-section of a leaf, showing the intercellular spaces in the interior, *i*, and in the epidermis (= stomata), *s*.

sue and the surrounding medium. This exchange is manifested by two processes. In one of these, viz., the manufacture of certain foods (see PHOTOSYNTHESIS), carbon dioxide is required by the plant and oxygen must be eliminated. On the contrary, in the other process, viz., respiration (q.v.), oxygen is necessary, and

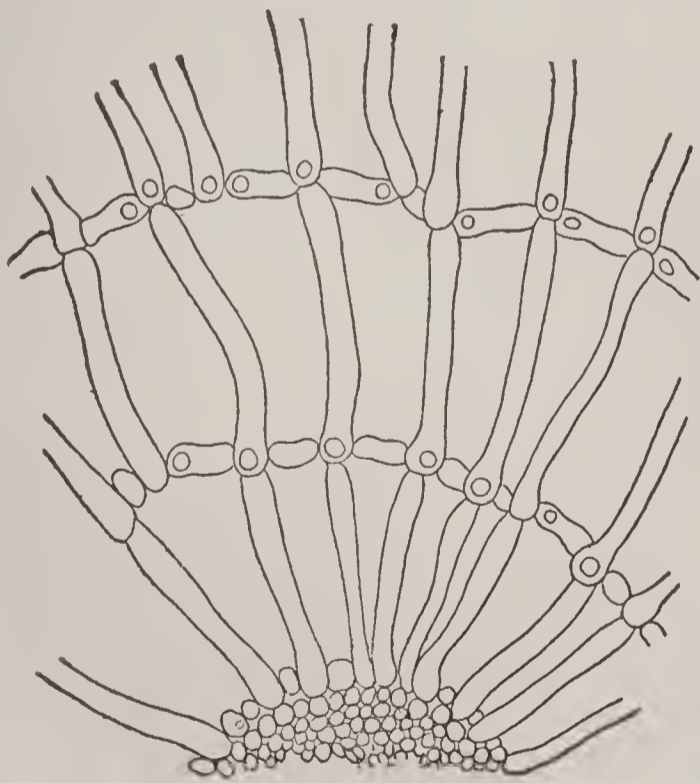


FIG. 2.

Part of a cross-section of the root of *Jussiaea*, showing aërenchyma, with enormous intercellular spaces, the cells being a mere scaffolding between the surface (not shown) and the central cylinder (at the lower margin).

carbon dioxide must be eliminated. The former process is confined to green plants; the latter is essential to all except a few of the lowest and simplest type (anaerobic bacteria). Among the smaller plants, and those whose bodies are made up of interwoven filaments (Fungi), the

gaseous exchanges can take place directly, since almost every part of the body is in contact with the air or with water. In the former case the outside gases dissolve in the constituent water of the cell-wall and are then free to enter; or, arising within the cell and being already dissolved, they pass off into the air. In water plants the free inward or outward migration of dissolved gases depends on the relative amounts inside and outside the body. (See ABSORPTION.) In the larger land plants the greater number of cells and the more compact structure make it impossible for the cells more distant from the surface to conduct the necessary changes at an adequate rate. Such plants have therefore developed an extensive aërating system (Fig. 1), consisting of irregular passages, *i*, between the interior cells, which communicate with the outer air through microscopic openings, *s*, between the surface cells (see STOMATA), or through larger breaks in the corky layers of tissue on the surface of the stems (see LENTICELS). The intercellular passages and stomata are formed by the partial separation of the cells as they mature. In land plants they are most abundant, and largest in the green parts, because the gas exchanges in food-making, photosynthesis, exceed those in respiration. In water plants, however, whose opportunity for securing gases from the air is more limited, the aërating system reaches its highest development. (See HYDROPHYTES.) The tissues may present to the eye a spongy appearance, and in some cases the canals in stems and leafstalks may even be large enough to be easily seen with the naked eye (Fig. 2). The internal atmosphere pervading these canals is voluminous enough to permit both considerable exchanges between it and the adjacent tissues and the freer diffusion of gases entering from the restricted area of organs exposed to the air. The composition of the internal atmosphere is generally different from that of the outer and varies from time to time. During the day the internal atmosphere contains less carbon dioxide and more oxygen than the external atmosphere, at night the reverse being the case. At all times the internal atmosphere contains a larger amount of water vapor, because the wetness of the cell-wall, which is necessary for gaseous exchanges, permits evaporation. The pressure of the internal atmosphere may also vary considerably from that outside. It is generally greatest in illumination and least in darkness. See TRANSPIRATION.

A'ËRA'TOR (literally, 'airer,' from Lat. *aër*, air). In dairying, an apparatus for aërating milk to remove the animal and barn odors. The milk is usually caused to run or ripple in a thin layer over an exposed surface immediately after milking, being, in most forms of apparatus, cooled at the same time by the use of ice, ice water, or cool water from wells or springs. Where aëration is combined with cooling, which removes the animal heat and thereby renders the conditions less favorable to the growth of the micro-organisms which cause souring and other changes, the keeping quality of the milk is increased. Aëration alone, however, has been found of much less benefit, and unless carried on in surroundings free from dust may even increase the opportunity for bacterial contamination. Aërotors should be simple in construction and easily cleaned.

AËRENCHYMA, *ā'ēr-ēn'kī-mā* (Gk. *ἀήρ*, *aēr*, air + *ἔγχυμα*, *enchyma*, infusion, in the

sense of a tissue). In plants, a loose, spongy tissue, which is especially common in water plants (see HYDROPHYTES), and which is supposed to facilitate aëration—whence the name. Aërenchyma is typically composed of more or less radially arranged arms of thin-walled cells inclosing large air spaces. For illustration, see AËRATION, fig. 2.

AËRIAL FAUNA, ā-ē'rī-al fā'nā. See DISTRIBUTION OF ANIMALS.

AËRIAL LAW. See NAVIGATION, AËRIAL, LAW OF.

AËRIAL PLANTS AND ROOTS. See EPIPHYTES; ROOTS.

AËRIAL POISONS. See MIASMA.

AËRIANS, ā-ē'rī-unz. A Christian sect founded in the fourth century by Aërius of Pontus. He opposed prayers for the dead and the keeping of Easter and all set fasts and asserted the equality between a bishop and a presbyter. John Glas (q.v.) wrote a scholarly monograph on the so-called heresy of Aërius (Perth, 1745), which so strikingly antedates Reformation doctrine. The original source is Epiphanius, *Adversus Hæreses*.

AËROBES. See RESPIRATION.

A'ËROCLI'NOSCOPE (Gk. ἀήρ, *aēr*, air + κλίνειν, *klinein*, to incline + σκοπεῖν, *skopein*, to watch, examine). An instrument invented by Buys Ballot and used in Holland and elsewhere as a storm signal. It consists of a vertical axis, turning on a pivot and carrying at the top a horizontal arm whose inclination can be varied. One end of this arm is painted red and the other white, and when weather conditions are normal it rests at a horizontal position. In case of falling barometer the arm is rotated so that the red end points in the direction of the storm, the amount of inclination indicating the degree of change in the barometer.

AËRO CLUB OF AMERICA. See AËRONAUTICS.

A'ËRODYNAM'ICS (Gk. ἀήρ, *aēr*, air + δύναμις, *dynamis*, power). That branch of science which treats of the properties of air and other gases in motion, and specially of the effect of the air upon solid bodies in motion through it. It is, therefore, a branch of pneumatics.

AËROLITE. See METEORITE.

A'ËROL'OGY (Gk. ἀήρ, *aēr*, air + λογία, *logia*, discourse). An old term, formerly used as applying to the physics of the atmosphere in general, recently revived by meteorologists, notably Köppen, as the name of that science which studies the physics of the higher strata of our atmosphere. The study of aërology is carried on by means of self-recording instruments attached to special kites, to manned balloons and to small free balloons called sounding-balloons. See METEOROLOGY.

A'ËROMAN'CY. See SUPERSTITION.

A'ËRONAU'TICS (Gk. ἀήρ, *aēr*, air + ναύτης, *nautēs*, sailor). The art of aërial navigation. It is of comparatively recent development, although it figures in classical mythology. A more comprehensible tale than the mythological legend of Dædalus related by Ovid, but yet one which is based entirely on tradition, is that told by Aulus Gellius in his *Attic Nights*, of the wooden dove invented by the Greek mathematician Archytas of Tarentum (400 B.C.), which could maintain sustained flight and was set in motion by

“hidden and inclosed air.” Archytas is also reputed to have invented a kite. Passing to the Middle Ages, there are recorded a few actual and usually disastrous attempts at gliding flight, but, generally speaking, the consideration of the problem of flight by human beings was confined mostly to surmise and speculations which in many cases were nearly as fanciful as the earlier Grecian fables. The thing which placed the art of aërial navigation upon a more practical basis than mere speculation was the invention of the balloon.

AËROSTATION

Balloons. The germ of the invention of balloons is to be found in the discovery by the English chemist and physicist, Henry Cavendish, in 1766, of the remarkable lightness of hydrogen gas, then called inflammable air. Professor Black, of Edinburgh, seems to have been the first who conceived the idea that a light envelope containing this gas would rise of itself; but for some reason or other the experiment was never made. The first practical attempts were made by Tiberius Cavallo, an Italian philosopher living in England, who in 1782 published an account of experiments in which he succeeded in raising soap-bubbles inflated with the gas.

The invention of the balloon is due to Etienne and Joseph Montgolfier, two wealthy paper-makers of Annonay, in France. It occurred to them, on reading Cavendish's *Different Kinds of Air*, that the air could be rendered navigable by inclosing a light gas within a covering of inconsiderable weight. They first attempted to make balloons of paper filled with inflammable air, but finding that these emptied themselves almost as soon as they were filled, instead of abandoning the paper as an unsuitable covering for the gas, they sought after another gas more suited to the paper. They thought that the gas which resulted from the combustion of slightly moistened straw and wool would answer the purpose, since it had, as they imagined, an upward tendency, not only because it was hot, but also because of its supposed electrical properties, which caused it to be repelled from the ground.

It is hardly necessary to say that this Montgolfier “gas” possessed no advantages for raising balloons other than that possessed by heated air of any kind; in fact, the abundant smoke with which it was mixed, by adding to its weight, rather detracted from its merits. At Avignon, in November, 1782, Etienne Montgolfier first succeeded in causing a silk paralleloiped, of about 50 cubic feet, to rise to the ceiling of a room. Encouraged by this success, the brothers made experiments on a larger scale at Annonay, 36 miles from Lyons, and finally, on June 5, 1783, they raised a balloon 35 feet in diameter to a height of 6000 feet. This balloon, nearly spherical in shape, was made of pack-cloth, covered with paper, and was heated by a small iron grate placed beneath it, in which 10 pounds of moist straw and wool were burned.

A commission was appointed by the Academy of Sciences at Paris to report upon the experiments of the Montgolfiers. A subscription was raised to defray the expense of repeating the Annonay experiment. The construction of the balloon was intrusted to the brothers Robert, famous philosophical instrument makers of the day, and to Professor Charles, a young but experienced physicist. As the detailed account of the Annonay ascent had not reached Paris, and

as nothing was therefore known of the Montgolfier gas, Charles fixed upon hydrogen as the gas most likely to insure success. It was, however, a formidable undertaking to produce it in abundance for a balloon, as it was at that time prepared only in small quantities in the lecture room and laboratory. He, however, succeeded in filling, in the course of four days, a silk globe 13 feet in diameter. This balloon was transferred to the Champs de Mars, where, on Aug. 27, 1783, it ascended in the presence of over 50,000 spectators. This was the first time that a hydrogen balloon ascended from the earth. At the instance of the commission already referred to, Etienne Montgolfier constructed a fire-balloon 72 feet high and 41 feet in diameter. It ascended before the commission on Sept. 12, 1783, but being held captive it was much injured by a violent wind which blew at the time, and after it descended it was finally broken up by heavy rains. Another was made, of nearly the same dimensions, which ascended on the 19th of the same month at Versailles, the King and royal family witnessing the spectacle. This ascent is worthy of note, from the fact that a sheep, a cock, and a duck were placed in a wicker basket attached to the lower part of the balloon and that these first aerial voyagers reached the ground again in safety. An interesting contemporary chronicle of these events is preserved in the letters of Benjamin Franklin, then in Paris.

The balloon was now an accomplished fact, and it began to be discussed whether it might not be serviceable as an airship for bearing men aloft as passengers. All doubt was dispelled by Pilâtre de Rozier. In a "montgolfière," as the heated air-balloon was called, 85 feet high and 48 feet in diameter, supporting at its base a gallery of wicker-work, he, in company with the Marquis d'Arlandes, made the first aerial voyage, Nov. 21, 1783. They remained in the air 25 minutes and sailed across the Seine and over a considerable part of Paris.

The year 1783, so fertile in the annals of aeronautics, witnessed an additional and even greater triumph. On December 1st Professor Charles, accompanied by one of the Robert brothers, rose from the Tuileries gardens with a hydrogen balloon—then called a "Charlière"—made with the proceeds of a public subscription. This balloon was made of alternate red and yellow gores of silk sewed together and coated with caoutchouc varnish, an invention of the Roberts. It was covered with a net which supported the car and was furnished with a valve, a barometer, and sand-ballast, and was, in fact, a complete aerial machine. In consequence of the danger attending the use of fire-balloons, and the demands made on the aeronaut's attention, hot-air balloons soon gave way to hydrogen balloons. They have now entirely given way to the hydrogen or coal-gas balloons for long voyages. Before montgolfières became obsolete several remarkable voyages were made in them. The same Pilâtre de Rozier made 30 leagues in one of them, the longest voyage ever executed in a montgolfière.

Among the names of the first professional aeronauts, those of Jean-Pierre Lunardi, Vincent Blanchard and A. J. Garnerin deserve special note. Lunardi made the second ascent in Great Britain, rising from London in 1784 in a hydrogen-filled balloon. The first ascent had been made in the same year by James Tyler; and Blanchard, along with an American, Dr. John Jeffries,

crossed the English Channel from Dover to Calais in circumstances of almost unparalleled danger, Jan. 7, 1785. Garnerin first descended from a balloon by a parachute (q.v.), Oct. 22, 1797. Pilâtre de Rozier, in an attempt to outvie Blanchard, constructed a compound machine, consisting of a hydrogen balloon above and a montgolfière below, and started from Boulogne, accompanied by a young physicist named Romain, on the morning of June 5, 1785. He had not ascended many minutes when, on attempting to open the valve of the hydrogen balloon by the rope attached to it, he caused a rent of several yards in it, so that it emptied itself almost immediately and fell on the montgolfière beneath. The fire in the latter not being kindled, the whole machine fell with a frightful rapidity to the earth, and the ill-fated aeronauts perished on the spot whence they had arisen.

Briefly described, the passive balloon, or aërostat, as it is commonly employed to-day, is a large pear-shaped or spherical bag, made of any pliable cloth, usually alpaca or cotton (though silk is the best), covered with a varnish, made by dissolving caoutchouc in oil of turpentine, to render it air-tight. Modern balloons have bags made of a special fabric formed of several layers of cotton or silk cloth by vulcanizing thin layers of rubber between them. The common size of the bag varies from 20 to 30 feet in equatorial diameter, with a proportionate height. The mouth or neck of this bag is just large enough to enable a man to get inside to make any necessary repairs and is, of course, turned downward when the balloon is inflated. A network of hempen or cotton twine is accurately fitted to the balloon, and the ends of the separate cords, of which it is formed, are tied to a circular hoop placed a few feet below the neck. The car, generally a large wicker-basket, is suspended by ropes from this hoop and hangs at a considerable distance below, so that the aeronaut may be removed from the vicinity of the gas. The network serves to distribute the weight of the car and its charge equally over the whole upper surface of the balloon. One of the most important requisites in the construction is the valve, which is introduced into the top of the balloon. It consists of a wooden or metal clapper, from 1 foot to 3 feet in diameter, opening inward, and kept closed by springs. A rope attached to this valve descends through the neck into the car, where, to prevent accidental opening, it is allowed to dangle freely. There is also a long ripping panel which extends from the equator to the summit of the balloon. This ripping panel can be torn open by a cord extending to the car below. This device, invented in 1844 by the American aeronaut, John Wise, serves to deflate the balloon quickly and to prevent its being dragged or bumped along the ground upon landing, should there be wind.

The equipment of the car comprises ballast, in the form of sandbags, by emptying which the balloon may be lightened; barometers or corresponding apparatus for indicating the height attained at any given moment; thermometers and hygrometers for determining respectively temperature and moisture; maps and a compass for showing the direction of the voyage; a grappling iron attached to a long rope for anchoring the balloon when it nears the ground; a long rope known as a guide or drag rope which may be trailed over land and water, serving to keep the balloon at a constant height without ex-

penditure of ballast and to check the speed on landing; photographic cameras and such additional instruments as may be needed.

During his flight the aëronaut has at his disposal the means of guiding his balloon only in an upward or downward direction, the motion of translation being wholly dependent on the wind. But he can take advantage of the air currents traveling in different directions at various heights by ascending or descending. If he wishes to ascend, he throws some of the ballast over the side of the car, and if to descend, he pulls the valve-rope, so that, the gas rushing by virtue of its specific lightness through the passage made for it by the open valve, the buoyant material may be lessened. It is evident that the power of thus directing his machine becomes more limited after each discharge of ballast or gas. In ordinary flights the mouth of the balloon is left open, so that there is no danger of explosion from the expansion of the gas in the rarer regions of the atmosphere.

The gas most commonly used for balloons is coal gas, first employed for this purpose by George Green in England in 1821. To-day hydrogen is generally available. It is either generated on the spot or drawn from steel tubes into which it has been compressed for convenient transportation.

Long Distance Balloon Voyages. Thanks to atmospheric researches and to the improved construction of balloons, venturesome aëronauts have made long journeys in spherical balloons or aëostats. Year by year the distances covered have increased, and annual international contests have stimulated interest in such flights. The first notable achievement occurred in 1836, when, on November 7th, Green, Mason, and Holland made a trip in *The Great Balloon of Nassau*, of 85,000 cubic feet capacity, from London to Weilburg, Germany, 500 miles in 18 hours. In 1859 the celebrated American aëronaut John Wise made 809 miles from St. Louis, Mo., to Henderson, N. Y., in 20 hours. In 1870 one of the balloons escaping from Paris during the siege sailed to Norway, about 1000 miles. An unofficial record of 1032 miles from Leipzig to Wilna in 24½ hours was made by M. Godard. At the Paris Exposition of 1900, on October 9th, the Comte de la Vaulx in the balloon *Centaure*, starting from Paris reached Korostichev, in Russia, 1193 miles, in 36 hours and 45 minutes. The extreme altitude attained on the trip was 18,810 feet. The *Centaure* was a balloon of 1650 cubic metres (58,000 cubic feet) capacity and on the trip was filled with a mixture of hydrogen and common illuminating gas.

This record stood for a number of years, though it was approached in 1910, when Augustus Post and A. R. Hawley in the spherical balloon *America* during the James Gordon Bennett balloon race of that year drifted 1173 miles from St. Louis, Mo., landing at Lake Chilogoma, near Peribonka, Quebec, several days distant from civilization. In 1912 a world's balloon record of 1211 miles was made on January 7th-8th by M. Emile Dubonnet and M. P. Dupont in *Condor III*, starting from La Motte-Breuil, France, and landing at Sokolowska, Russia, and in turn was supplanted in the Gordon Bennett cup race of the same year when of 20 balloons leaving Stuttgart, Germany, the *Picardie* with M. Maurice Bienaimé as pilot and M. Rumpelmayer as aide, landed near Moscow two days later after a trip of 1361½ miles. On March

24, 1913, Rumpelmayer made a trip of 1492 miles from Paris to a point near Kharkov, Russia. The James Gordon Bennett cup referred to is competed for annually by spherical balloons without motive power and has served to increase interest in this branch of aëronautics. The race is started from some city in the country holding the cup for that year.

Balloon Altitude Records. High ascents in balloons have been made by a number of aëronauts. On Sept. 5, 1862, two English aëronauts, Messrs. James Coxwell and Henry Glaisher, starting from Wolverhampton, England, ascended to a point calculated by them as 37,000 feet, or fully 7 miles. This ascent, however, is now generally estimated at less than 6 miles. At a height of 5½ miles one of the aëronauts became insensible and the other very nearly so; at the height of 4 miles railway trains could be heard, but at a height of 6 miles there was perfect silence. On April 15, 1875, M. Gaston Tissandier and two companions, MM. de Sive and Crocé-Spinelli, rose from Paris in the spherical balloon *Zenith*, a height of 5⅓ miles. M. Tissandier alone survived the trip, his companions dying in mid-air, and he himself being rendered unconscious. In later years, by the use of oxygen in the rarefied higher atmosphere great heights have been attained with more facility. On July 31, 1901, Professor Berson and Dr. Süring, two German aëronauts ascending from Berlin in the balloon *Prussia* of 300,000 cubic feet volume, reached a height of 35,600 feet, which has remained as the world's record. On May 28, 1913, this record was approached by MM. Bienaimé, Jacques Schneider, and Albert Lenorique in the balloon *Icaré*. Ascending from Lamotte-Breuil in France, they attained a height of 10,081 meters (33,074 feet), or approximately 6¼ miles. They were provided with oxygen respiration apparatus and aside from the extreme cold suffered no inconvenience.

Captive Balloons, as the name signifies, are balloons which are held captive to the earth by means of a cable. The cable is usually arranged to be let out and hauled in by means of a windlass or drum operated by hand or by mechanical power. Although they will eventually be supplanted by dirigible airships and aëroplanes, captive balloons have been much used for military observations (see MILITARY AËRONAUTICS) and for amusement purposes, as Giffard's famous balloon of 45,000 cubic feet capacity carrying 40 passengers, which was a feature of the Paris Exposition of 1878. Captive balloons are employed to some extent for scientific observations. At the Lindenberg Observatory, Feb. 20, 1913, three such balloons were sent up to a height of 7180 meters (23,556 feet), but more often the *ballons sondes* (sounding balloons) are used.

Exploration and Research. Scientific research by means of balloons has been undertaken in a number of instances, the most notable attempt, perhaps, being that of the Arctic explorer Andrée to reach the North Pole in the summer of 1897. The explorer and his companions perished. With the development of the dirigible balloon, its availability for exploration was at once suggested. In 1906 and 1907 preparations were made for a trip to the North Pole in an airship constructed for the Wellman *Chicago Record-Herald* Arctic Expedition. This airship was to start from a base

in Spitzbergen and was designed to make a speed of about 15 miles an hour on a 10 days' trip. The contemplated duration of inflation was from 15 to 20 days, and the two motors were of 50 and 25 horse-power respectively. Unsuccessful attempts were made to use this airship in 1906 and 1907. Subsequently active steps were being taken in Germany to organize an expedition to the North Pole making use of a Zeppelin airship.

Aërological Research. The first ascension of any value for scientific observations was that of Gay Lussac, in 1804, from Paris. The balloon rose to 23,000 feet, and the fall in temperature was 67° F., or 1° in 340 feet. Specimens of air collected at the highest point showed precisely the same composition as at the earth. The magnetic force did not exhibit any sensible variation at different heights. The next ascent of importance was that of Barral and Bixto in July, 1850. At 19,700 feet the aëronauts observed a temperature in a cloud of 15° F., and at 23,000 feet above the cloud a temperature of -38° F. The ascent of James Glaisher in 1862, previously referred to, is famous for its extreme height, and there have been several other ascents of less height from which fruitful scientific results have been obtained. On March 21, 1893, a balloon 19.7 feet in diameter, carrying a self-registering barometer and thermometer, was sent up from Paris. The records made by these instruments were examined when the balloon descended and appeared to show that the balloon rose to a height of 45,920 feet, when the ink froze at a temperature of -32° C., and the record was discontinued until at a height of 52,490 feet the ink was thawed by solar radiation and the record was resumed. The correctness of these figures has been seriously questioned, but if they are accurate the balloon reached a height of nearly 10 miles.

All scientific aëronauts keep careful records of atmospheric conditions during their ascents, but they are limited in the altitudes they attain because of their physical limitations as human beings. This has led to the extensive use of small india-rubber unmanned balloons, *ballons sondes*, which carry recording apparatus to considerable heights and thus enable a study to be made of atmospheric conditions. This method of research was developed in France by P. E. Teisserenc de Bort, in Germany by Dr. Richard Assmann, and in America by A. Lawrence Rotch. The balloons, some of which have gone as high as 18 miles, are filled with pure hydrogen gas, which enables them to reach considerable altitudes, at which the pressure of the gas bursts the envelope of the balloon, while the meteorograph (a combination of instruments, such as a barometer, thermometer and hygrometer), which is attached to a parachute or second balloon, falls to the ground without injury. The instrument is sufficiently conspicuous to attract attention, and it is picked up and forwarded to the station from which the balloon was dispatched. While this has been a favorite method of research in France and Germany, it was not tried in the United States until 1904, in connection with the St. Louis Exposition. Regular observations with *ballons sondes* are now made by the United States Weather Bureau. Such is the importance of these studies that many aërological observatories have been established all over the civilized world. In addition

to their routine work, ascents with kites and *ballons sondes* are made at these observatories on dates agreed upon at international conferences.

The first important test of *ballons sondes* at sea was made in the spring of 1905, by P. E. Teisserenc de Bort and A. Lawrence Rotch, with the aid of the Prince of Monaco's yacht. These experiments settled all doubt regarding the direction of the counter trade winds and proved their existence conclusively.

Pilot Balloons. These small unmanned balloons are sent up from aëronautical and meteorological stations, and their course and elevation are watched with a theodolite so that the direction and strength of the air currents can be determined. These pilot balloons reach an average height of 2½ to 5 miles. Their function is different from that of the *ballons sondes*, as they enable the observer to ascertain at once the direction of the air currents and their intensity. Hence they are employed at aërological observatories to determine the direction which a more expensive *ballon sonde* will take after it is released. For example, just before a Zeppelin airship sets out, several of these balloons are released, and their behavior in the air observed.

Aëro Club of America. In 1905 considerable interest began to be manifested in ballooning in the United States, and the Aëro Club of America was formed in the summer of 1905 by men for the most part interested in motor cars, but to whom the balloon appealed. The club was an original member of the Federation Aeronautique Internationale founded in 1905. In 1913, 45 pilots for spherical balloons in the United States had been licensed by that body. Of these two were deceased. In January, 1906, it held its first exhibition at the Sixth Annual Automobile Show in New York. The Aëro Club did not restrict itself to aërostation, but all forms of aërial navigation were included in its activities, and in particular its members have exhibited the greatest interest in aviation and the development of aërial navigation.

DIRIGIBLE BALLOONS OR AIRSHIPS

Dirigible Balloons. It was early suggested that balloons could be arranged with steering apparatus and propelling machinery, by which the direction of their flight could be regulated at will. Such pioneer aëronauts as the Robert brothers endeavored to paddle or row their balloons through the air with silk-covered oars worked by hand. Instead of spherical or pear-shaped gas bags, pointed envelopes of elongated form were early suggested. The design for a very elaborate power balloon operated by muscular effort was in fact worked out in great detail in France by General Meusnier. Lack of an efficient source of power in the form of a light-weight engine hindered attempts in this direction, and despite Julien's torpedo-shaped model of 1850, it was not until Giffard, the inventor of the steam injector, in 1852 constructed a spindle-shaped gas bag, 143 feet in length by 39 feet in diameter, driven by a 11-foot propeller screw connected with a 3-horse-power steam engine, that the idea was realized. After a successful dirigible had also been constructed by Dupuy de Lome in 1872, Gaston Tissandier in 1882 built a balloon, 91 feet long and 29 feet in diameter, in the shape of a very thick cigar, with both ends pointed. The envelope was made

of thin cloth covered with an impermeable varnish, and from it was hung by means of the usual netting and suspenders a car containing an electric battery supplying current to an electric motor which operated a two-bladed screw propeller $9\frac{1}{4}$ feet in diameter. A triangular silk rudder was fitted above the propeller in much the same relative position as the rudder of a steamship and arranged so as to be operated from the car. The total weight of the propelling machinery, the car and the appurtenances, exclusive of 850 pounds of ballast, was 1200 pounds, while the balloon itself weighed 600 pounds. With the propeller making 180 revolutions per minute this balloon was able to maintain its position against a wind blowing 6.8 miles per hour, and when traveling with the wind to deviate to one side or the other with ease.

This balloon was followed in 1884 by one of the French government, also driven by an electric battery and motors, the construction having been suggested by Tissandier's experiments. The craft was designed by MM. Renard and Krebs on similar lines to, but somewhat longer (165 feet) in comparison with its diameter (27.5 feet) than Tissandier's. Seven ascents were made during 1884-85 with this airship, which was named *La France*, with the following practical results: In five of the ascents the voyagers were able to return to their starting point, and an average speed of 14.5 miles per hour was attained independently of the wind.

Such efforts and experiments, however, may be considered merely as preliminary to the more practical work of the development of the dirigible, which towards the close of the nineteenth century was made possible in a large part by the evolution of a suitable light-weight internal combustion motor to drive the propellers. But there were other questions besides motive power. To be driven economically and efficiently through the air, a gas bag must be kept inflated. Hence, to preserve the shape of the envelope, two systems of construction have been developed. One of these depends entirely on inflation for preservation of the envelope shape, any deformation or sagging caused by loss of gas being overcome by internal ballonets inflated by air from a pump. This type has been brought to great perfection by Major Parseval in Germany. The second system, with which the name of Count Zeppelin is linked, depends on a rigid fabric-covered frame for maintaining the shape of the airship, the gas being stored in separate compartments within the frame. Midway between these two systems stands the French semi-rigid construction, in which a collapsible envelope, with internal ballonets, is stiffened by means of a rigid keel extending beneath the envelope.

Zeppelin Airships. In 1900 Count Zeppelin brought out his first and notable airship, introducing the rigid form and serving as the prototype for many subsequent dirigibles, although a few years previously (1897) Schwartz, an Austrian, had constructed a rigid metal-framed balloon driven by an internal combustion motor and propellers. Count Zeppelin's 1900 model consisted of a row of 17 balloons, confined like lozenges in a package, in a cylindrical shell 416 feet long and 38 feet in diameter, with pointed ends and having a capacity of 399,000 cubic feet. These balloons served to lift the structure in the air, where it was driven forward or backward by means of large screw propellers. A pair of rudders, one forward

and one aft, served to steer the airship. The crew and passengers occupied two aluminum cars suspended forward and aft, below the body of the balloon shell. From these cars, which were connected by a speaking tube, all the machinery of the airship was operated. The Daimler benzine engines, one in each car, were of 16 horse-power capacity each, and weighed 715 pounds each. The screw propellers, two for each engine, had four blades and were $3\frac{3}{4}$ feet in diameter. At the first trial of the Zeppelin airship on July 2, 1900, with five persons in the cars, it rose 1300 feet above Lake Constance and traveled $3\frac{3}{4}$ miles in 17 minutes in the direction desired. In 1905 Count Zeppelin made extensive trials of a new and much improved airship. Thus the two engines of the 1905 airship were able to supply 170 horse-power at an increase in weight of only a few pounds, the entire machinery weighing but 880 pounds. Furthermore, the length of the new airship was decreased to 410 feet, and the number of gas compartments was made 16 instead of 17. The cubical contents of the balloon were diminished to 367,120 feet, while the weight to be lifted was smaller by 2200 pounds, amounting to about 19,800 pounds. The propellers, on the other hand, were of increased size. In 1908, with the improved but short-lived *Zeppelin IV*, 260 miles were accomplished in nine hours. Count Zeppelin next proceeded to rebuild his older airships, and in 1909, with *Zeppelin III*, made a flight from Friedrichshafen to Berlin and return, a total distance of 800 miles.

To the Zeppelin airship must be given credit for first establishing a commercial means of regular passenger travel in the air. On June 22, 1910, the *Deutschland* made a successful trip with passengers from Friedrichshafen to Düsseldorf, a distance of 300 miles at an average speed of 33 miles an hour. On the third trip the craft was caught in a severe storm and wrecked in a forest.

In 1911 the *Schwaben*, slightly smaller than the *Deutschland*, but with accommodations for 24 passengers and improved mechanical features, was brought out and put into regular service, where its 165 horse-power motors, developing a speed of 43 miles an hour, were able to insure runs on schedule time. The *Schwaben* was destroyed June 28, 1912, at Düsseldorf while moored during a severe gale. It had made 364 successful trips aggregating 28,000 miles and had safely carried 6045 passengers. The *Viktoria-Luise*, an airship of slightly greater speed, was brought out in 1912 and also succeeded in passenger service. Other large airships were built, and on June 9, 1913, the *Sachsen*, the seventeenth Zeppelin airship, under the direction of Count Zeppelin himself, made a trip from Baden-Baden to Vienna, a distance of 435 miles in 8 hours, or an average speed of $54\frac{1}{3}$ miles an hour. Twenty-four passengers were carried on a visit to Emperor Francis Joseph of Austria, and the journey was accomplished in about one-half the time required by the express train between the two cities.

In 1913, 10 Zeppelin airships were in service, several of which had a gas capacity of between 600,000 and 700,000 cubic feet, and it was planned to construct 20 more of the same type. Tourist tickets entitling the holder to passage on the regular trips of these airships were sold in the leading cities of the world.

The huge gas bag with the rigid frame of the Zeppelin airship makes possible great lifting capacity amounting in some cases to five or six tons, which affords accommodations for 24 passengers with substantial cabin conveniences, yet it presents an enormous surface to the wind so that its structural strength is often severely tested. These features, which of course are common to all large airships, are not ordinarily a serious matter when the dirigible is in the air with engines in motion, but may become so, as was evidenced by the loss of the German military dirigible *L I* in 1913 off the coast of Heligoland when 14 of the officers and crew perished. It was but a few weeks after this accident that the military dirigible *L II* was wrecked, on Oct. 17, presumably by an explosion, and totally destroyed at a height of 900 feet, 28 officers and men of the crew perishing. The explosion was thought to have taken place in a partial vacuum space behind a wind shield in front of the centre car, where escaping gas was drawn and exploded by a spark from the motor.

The exposure of a large surface to the wind becomes a serious source of danger when the airship is held to the earth by mooring cables with the gas bag inflated. It has been under such conditions that most of the serious accidents to the Zeppelin airships have occurred. Nevertheless the airship with its powerful engines has a wide sphere of usefulness, and its importance in military operations early was recognized, as will be found discussed elsewhere. (See MILITARY AËRONAUTICS.) The crew of these airships are regular trained men, with a view to their possible use in time of war, and for their protection from attack it has been planned to provide them with armor and machine guns.

Airships of Santos-Dumont. In striking contrast with the large Zeppelin dirigible with its rigid frame were smaller airships built about the same time by M. Alberto Santos-Dumont, a Brazilian gentleman resident in Paris. To him is due the credit of having first successfully employed the internal combustion motor on an airship. This aëronaut, whose experiments at the time excited widespread interest, built his first airship in 1898, but previously, in 1880, Wölfert, a German, had attempted to drive a dirigible balloon by an internal combustion engine with benzine for fuel. Santos-Dumont's earliest airship was in the form of a cylinder, terminated at each end by a cone, and was 82 feet long and 11½ feet in diameter, with a capacity of 6400 cubic feet. A basket suspended from the balloon carried a 3½ horse-power gasoline motor, which operated a screw propeller. Another balloon, shorter and very much thicker, was completed in the summer of 1899, and with this M. Santos-Dumont was able to circle around the Eiffel Tower. On July 11, 1901, M. Santos-Dumont navigated an enlarged and improved balloon from Saint-Cloud to and around the Eiffel Tower in an attempt to win a prize of 100,000 francs offered by Henri Deutsch de la Meurthe, and was approaching the starting point in the teeth of a strong head wind when the motor stopped, and the whole structure, with its operator, was precipitated into a chestnut tree. Another attempt to win the prize on Aug. 8, 1901, in the repaired airship, ended in the destruction of the craft, because of a defective valve. On Oct. 19, 1901, in his sixth balloon Santos-Dumont succeeded in making a trip from Saint-

Cloud to and around the Eiffel Tower and then back to the starting point in 30 minutes 40¼ seconds. The trip won the coveted prize of 100,000 francs offered to the aëronaut who should make the journey in 30 minutes.

In rapid succession the Brazilian aëronaut constructed balloons, each embodying some new feature, and in the main marking an advance over its predecessors, but finally gave them up in favor of the aëroplane.

French Dirigibles. Following Santos-Dumont's airship came the larger and more practical dirigibles of the Lebaudy brothers. The 1903 airship, called the *Yellow (Le Jaune)*, consisted of a long and finely pointed balloon, containing 80,000 cubic feet of gas and with its lower surface flat. Around the balloon was a frame of steel tubing, from which the car was suspended. The balloon for this airship was made of two thicknesses of cotton cloth colored yellow to protect the India-rubber placed between from the actinic effects of the sunlight, and, while reasonably light, was quite impervious to the gas. Both in the framework and in the machinery there was a solidity and rigidity of construction, and throughout, all details were developed with a careful consideration of the best engineering principles and practice. The car was of steel and contained a Mercedes engine of 40 horse-power, driving steel propellers which rotated at a rate of 1000 revolutions a minute. The weight of this airship, including its passengers, was 5700 pounds. In 1903 it traveled on one trip 61 miles and was in the air 2¾ hours. The best speed recorded was 25 miles an hour, and were it not for the untimely destruction of the airship in a fierce gale, while resting on the ground, much more could doubtless have been accomplished. In 1904 a new airship, the *Lebaudy*, was built, embodying essentially the features of the former. In this a motor was used whose weight was about 7½ kilograms (16½ pounds) per horse-power, and the consumption of fuel was but 315 grams per horse-power. The *Lebaudy* was cigar-shaped, with its rear end rounded. It was 57.75 meters (189.5 feet) in length; its maximum diameter was 9.80 meters (32.5 feet), and it had a volume of 2666 cubic meters, which afforded a sustaining capacity for more than three tons. In the experiments with this airship it was demonstrated conclusively that it could be controlled in windy weather and could maintain its equilibrium satisfactorily. In 1905 a new Lebaudy airship was constructed, which had about the same length but greater transverse dimensions and capacity of volume of the envelope than that of the previous year, besides having a more powerful motor. This balloon was turned over to the French army and furnished an excellent account of itself. In 1906 the MM. Lebaudy were commissioned to construct a new airship which was named *La Patrie* and was used successfully until carried away in a storm and destroyed in 1907.

La République, built on very similar lines but in some respects an improvement on the Lebaudy airships, was also acquired by the French army, but was destroyed in 1909 in an accident caused by the breaking of one of the propeller blades, which cut through the gas bag. The crew, consisting of four officers and men, was killed. Since that accident it has become the general practice to follow the Zeppelin plan of storing

the gas in more than one compartment, so that all of it may not be lost when the envelope is pierced in a single spot.

In the development of the dirigible balloon for military purposes and in its operation the officers of the French army worked most assiduously, and despite accident and misfortune they persevered in their efforts. Details of design and construction were improved, aëronauts and air pilots were trained, and aided by considerable private interest the air-fleet was continually augmented. Preference for the semi-rigid flexible as typified in the *Ville de Paris, France*, and *Clement-Bayard*, rather than for the Zeppelin form of construction, was manifested, and it was not until 1912 that the *Spiess*, a rigid dirigible with a wooden frame, was added to the French air fleet. This airship, with a capacity of 11,500 cubic meters (371,000 cubic feet), in 1913 was the largest French dirigible, yet it was considerably smaller than several in Germany. In addition to Lebaudy, the Zodiac and Astra companies had built notable airships along the lines of the German Parsevals. In 1913 the French air fleet included some excellent airships, of which the *Adjutant-Vincenot*, the *Adjutant-Reau*, and the *Dupuy-de-Lôme*, each of about 9000 cubic meters (318,000 cubic feet) capacity and 55 kilometers (34 miles) per hour speed, are worthy of mention, as is also the smaller but speedier *Fleurus*. All of these were of the non-rigid type and were built in 1911 and 1912. Of their military value, however, more extended discussion will be found under MILITARY AËRONAUTICS.

German Dirigibles. In Germany, through the efforts of Major von Parseval, of the Bavarian army, who had also been one of the inventors of the kite balloon, there was developed a form of dirigible balloon without a rigid frame which could be transported readily by an army in the field and inflated from portable gas cylinders or generating apparatus. This type of airship proved one of the most successful to be developed in Germany, and by 1913 17 had been constructed for military and commercial purposes, several having been designed for passenger traffic—one, the *Parseval*, having been operated about Berlin with notable success. The 1913 type of Parseval had a more slender envelope and was driven by two motors placed to the right and left above the suspended car. Each propeller had four blades of elastic steel $\frac{1}{25}$ of an inch thick and driven by a 6-cylinder motor. In some cases increased stiffening was being given, but the framing was of wood instead of aluminum as in the Zeppelin airships. In addition, among the dirigible balloons that were adopted by the German army, were several Gross airships designed by Major von Gross of the balloon section which, while supplied with a stiffening frame, were neither as large nor as well equipped as the Zeppelin craft, but were well suited for many military purposes. Another important type of German airship was the Schütte-Lanz, with a rigid framing of wood and large gas capacity. Mention also should be made of the Suchard airships, the first of which, completed in 1912, was designed for a long ocean voyage, but never even attempted the journey. Aside from the Zeppelin airships most of the aëronautical developments with dirigibles have taken place in connection with the military and naval services. See MILITARY AËRONAUTICS.

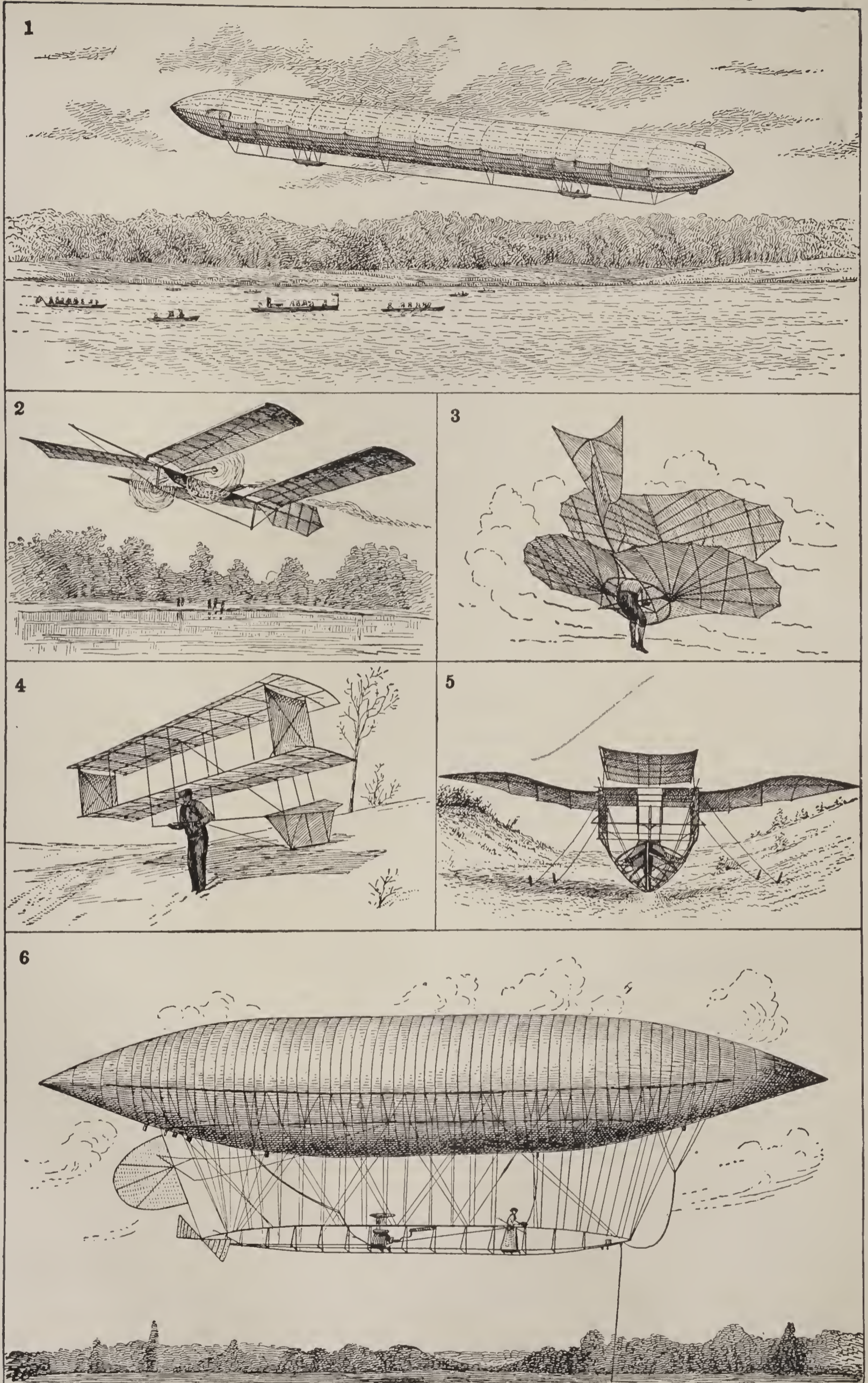
American Airships. In the United States flights have been made by airships, but little has been accomplished in any way comparable with European achievements. A dirigible balloon of limited size, representing the best American and foreign practice at the time, was constructed for the United States Army Signal Corps by Thomas S. Baldwin and was turned over to the government after satisfactory tests in August, 1908. It had a spindle-shaped gas bag 96 feet in length and of 20,000 cubic feet capacity and was driven by a 20 horse-power water-cooled gasoline motor of the Curtiss type. The lifting capacity of the balloon was 1350 pounds, and of this 500 pounds was available for passengers, fuel, and ballast. The speed developed on the trial trip over a measured course was 19.61 miles an hour. A few small rather crude airships were built for exhibition purposes, but the only really notable American airships were those built to make a transatlantic voyage. On Oct. 15, 1910, Walter Wellman, who in 1906 and 1907 had made unsuccessful attempts to reach the North Pole from a base in Spitzbergen, set out from Atlantic City, N. J., in an attempt to cross the Atlantic Ocean in a dirigible 228 feet in length and having a lifting capacity of 23,650 pounds. This airship, the *America*, designed by Melvin Vaniman, was cigar-shaped. The engines and propellers were designed to give a speed of 26 miles an hour with both engines working, and a crossing in six days was planned. The airship embodied a number of new features, among which was a so-called "equilibrator" corresponding to the drag rope of an ordinary balloon and consisting of some 30 cans of gasoline strung together to form a cable, the idea being that as the fuel was exhausted the lessened weight would compensate for the escaping gas of the balloon proper. The *America* drifted out to sea on Oct. 15, 1910, and within five hours met with a failure of the engine which was followed by other misfortunes, including unfavorable weather. The crew was compelled to abandon the airship and take refuge on a passing steamer after having been in the air $71\frac{1}{2}$ hours and after having drifted or sailed a distance of 1008 miles, both of which were records for dirigibles. Despite her failure the *America* was the first airship that was a credit to the United States in originality of design and construction.

Melvin Vaniman, designer and chief engineer of the *America*, decided to make another attempt on his own account. He designed a new and larger airship which embodied original ideas as well as the results of European experience. This vessel was built in the following year. It had powerful engines. Like the *America*, the *Akron*, as the new craft was called, compared favorably with the large dirigibles of Europe. On July 2, 1912, the *Akron* left its quarters at Atlantic City on its initial trip and within less than half an hour was totally destroyed by an explosion, due to fire or other cause not definitely determined. Vaniman and his crew of four perished.

AVIATION

Mechanical Flight. All devices for mechanical flight may properly be classed as passive and power or dynamic flying machines. The passive fliers in turn can be divided into machines intended for gliding flight, or, as the modern aviator terms it, *volplaning*, and those designed for

AIRSHIPS AND FLYING-MACHINES — HISTORIC TYPES



1. DIRIGIBLE BALLOON OF COUNT ZEPPELIN,
In flight, July 2, 1900.
2. LANGLEY'S AERODROME, in flight.

3. LILIENTHAL'S APPARATUS FOR SOARING FLIGHT.
4-5. CHANUTE'S APPARATUS FOR SOARING FLIGHT.
6. SANTOS-DUMONT'S AIRSHIP.

soaring or moving through the air, without loss of altitude, by the force of the wind. Obviously experiments with passive fliers and those with dynamic machines are intimately related, and the development of the latter has depended in large measure upon investigations with gliders and soaring devices.

There are on record a few more or less authenticated early instances of persons who by some parachute-like contrivance attempted to imitate the flight of birds. Some of these antedate the balloon by centuries. There is the story, for example, of Elmerus, a monk, who is said to have flown more than a furlong from the top of a tower in Spain, a distance probably much exaggerated. Leonardo da Vinci made a serious proposal to beat a pair of mechanical wings and also considered the use of an aerial screw, as sketches in his notebooks testify. An interesting paper by him on *The Flight of Birds* was published in 1505. In the seventeenth century Allard, a tight-rope dancer, attempted a flight with artificial wings in the presence of Louis XIV, while in 1678 Besnier, a locksmith of Sable, France, built a pair of oscillating wings with which he was reputed to be able to leap safely from very elevated positions and to pass over rivers of considerable breadth. There is no evidence that he ever accomplished such feats, and whatever he did was probably the result of dexterity in the use of the wings rather than of any inherent virtue they possessed. The first properly authenticated account of an artificial wing was that given by Borelli in 1670, and despite fundamental errors his experiments and conclusions were the basis for such investigations as were undertaken for many years.

Perhaps the first to make substantial and original contributions to the modern science of aviation was an Englishman, Sir George Cayley, who in 1809 and 1810 described in *Nicholson's Journal* experiments with aerial gliders in the form of large models. He took into consideration the placing of the wings at an angle of incidence, the use of a tail to steady the machine, and even calculated the energy necessary for propulsion from an engine. Realizing that the steam engine of his day was out of the question, he even suggested the use of an internal combustion engine. In 1867 Prof. J. B. Pettigrew, an English scientist, published the results of an elaborate and careful series of studies made by him upon the flight of birds, which wrought a revolution in the construction of flying machines.

Previously, in 1842, William Samuel Henson, of Chard, England, had designed and patented a flying machine which had a single supporting surface and two aerial screws driven by a steam engine. It was of course impossible at that time to construct a full-size machine, but it was the earliest commercially designed aeroplane and contained many principles later embodied in present-day machines, notably the system of control which was substantially that of the early Voisin monoplane. Some of these early features were cited in the litigation on the Wright patents 70 years afterwards.

F. H. Wenham, also an Englishman, in 1867, thinking to improve upon Henson, invented what he designated as a multiplane or aeroplane with two or more supporting superposed surfaces to secure increased sustaining power without increasing the general plan. In his design we have the forerunner of the modern biplane. John Stringfellow, who was originally

associated with Henson and had constructed the first successful flying model aeroplane in 1848 (for it flew about 40 yards), built a second model in 1868 in which Wenham's aeroplanes were combined with aerial screws. This model was on view at the exhibition of the Aeronautical Society of Great Britain, held at the Crystal Palace, London, in 1868. It had three superposed and parallel planes and was remarkably compact and light, obtaining the \$500 prize of the exhibition for its engine, which was the most powerful for its weight ever constructed. The aeroplane was not successful and later was purchased by Prof. S. P. Langley for the United States National Museum in Washington, where it is now on exhibition. In 1873 a tandem monoplane with two lifting planes was invented by D. S. Brown, and in 1874 Thomas Moy invented an aerial steamer, consisting of a light powerful skeleton frame resting on three wheels, a very light and efficient engine which was built on a new principle and which dispensed with the old-fashioned cumbersome boiler, narrow horizontal aeroplanes, and two very large aerial screws. This engine, which weighed with its boiler 80 pounds, developed fully 3 horse-power. In its general features Moy's machine resembled that of Stringfellow.

Mention might here be made of the invention and design of model aeroplanes, wings, and screws by M. Pénaud in which twisted india-rubber furnished the motive power. He constructed models to fly by three different methods: (1) by means of screws acting vertically upward; (2) by aeroplanes propelled horizontally by screws, and (3) by wings which were flapped in an upward and downward direction. These models were so far successful as to mark a considerable degree of progress and offer hints for future guidance by investigators and inventors. Indeed they may be regarded as the immediate stepping-stones to Langley's first successful work.

Various experiments with flying-machine models of many forms and occasionally with full-sized machines were carried on by inventors. The most satisfactory results, as will be seen, were secured with flat or slightly curved supporting surfaces; but, before proceeding to their consideration, brief mention can be given of other classes of devices suggested and employed. Vertical screw machines, or helicopters, have much to recommend them, but they present drawbacks which more than counterbalance the advantages. The ability to rise directly into the air from any given spot is exceedingly desirable, and hence a great many attempts have been made to develop a successful vertical screw machine. The greatest stumbling-block to success has been that when the surfaces which form the blades of the screws are revolved over one spot they do not give lifting effect commensurate with the power consumed. The beating wing machines, or ornithopters, are subject to the same disadvantages in regard to the enormous power required as those of the vertical screw type. In addition to this, the problem of maintaining equilibrium in windy weather still further complicates matters. Moreover, any combination in a single machine of the salient features of two or more of the classes of machines described tends to complicate rather than to improve the situation.

Both theory and experiment early indicated that a practical machine for artificial flight could be best secured by the use of the principle of a sustaining surface advanced through the air, or, in other words, an aeroplane or aërocurve.

When a thin surface is drawn through the air and is slightly inclined to its path, the equivalent of a pressure is developed on the side which is exposed to the air current—that is, the under side—which is much greater than the driving force which is necessary to produce it. If a surface arched in the line of the motion be substituted for the plane, we have an aërocurve, whose chief advantage is that it has a higher efficiency, as was successfully demonstrated by Horatio Phillips in England in 1884. Latterly, however, there is a tendency to employ rather flat surfaces, particularly on high-speed machines.

The earliest systematic experiments to apply this principle of the supporting plane were those of Sir Hiram Maxim of England, Prof. S. P. Langley of the United States, and Otto Lilienthal of Germany. These pioneer workers experimented not only with models but with large devices capable of carrying a man, and their results have proved of the greatest value in the development of the art. In a paper written in 1896 Sir Hiram Maxim summarizes some of the principal results of his experiments which, begun in 1889, dealt in much detail with the atmospheric resistance of sustaining surfaces and the thrust of screw propellers. Maxim's ideas found expression in 1893 in a gigantic twin-screw multi-plane flying machine, the largest ever built. A propos of its construction and his investigations he wrote: "My experiments have certainly demonstrated that a steam engine and boiler may be made which will generate a horse-power for every six pounds of weight, and that the whole motor, including the gas generator, the water supply, the condenser, and the pumps may be all made to come inside of 11 pounds to the horse-power. They also show that well-made screw propellers working in the air are fairly efficient, and that they obtain a sufficient grip upon the air to drive the machine forward at a high velocity; that very large aëroplanes, if well made and placed at a proper angle, will lift as much as $2\frac{1}{2}$ pounds per square foot at a velocity not greater than 40 miles an hour; also that it is possible for a machine to be made so light and at the same time so powerful that it will lift not only its own weight but a considerable amount besides, with no other energy except that derived from its own engines. Therefore there can be no question but that a flying machine is now possible without the aid of a balloon in any form."

The machine was mounted on rails so that it could rise, but was prevented from flying freely by an upper guard track. Several runs were made during which the machine rose from the lower track. On a gusty day in 1893 the machine during a test carried away part of the upper track and was damaged. In the light of later achievements it is not likely that the machine would ever have flown freely for any length of time. Nevertheless its construction is a milestone in the history of aviation; for Maxim had hit on much that present-day experience and knowledge endorse.

In 1891 Professor Langley published his now famous memoir entitled *Experiments in Aërodynamics*, and in 1893 his equally celebrated book on the *Internal Work of the Wind*. The experiments upon which many of the statements in these books were based were begun in 1887, and from 1891 to 1896 Professor Langley was more or less constantly at work perfecting a model flying machine which he termed an "aërodrome." It

may be said, in passing, that unfortunately this name later was applied with far less accuracy to the special ground or park from which flying machines made ascents. Professor Langley's small model, which was driven by a steam engine using naphtha as fuel, made its first successful flight on May 6, 1896. It was flown several times and came down when the fuel gave out. The average distance accomplished was about three-quarters of a mile. This was the first time in history that a motor-driven aëroplane accomplished a sustained flight.

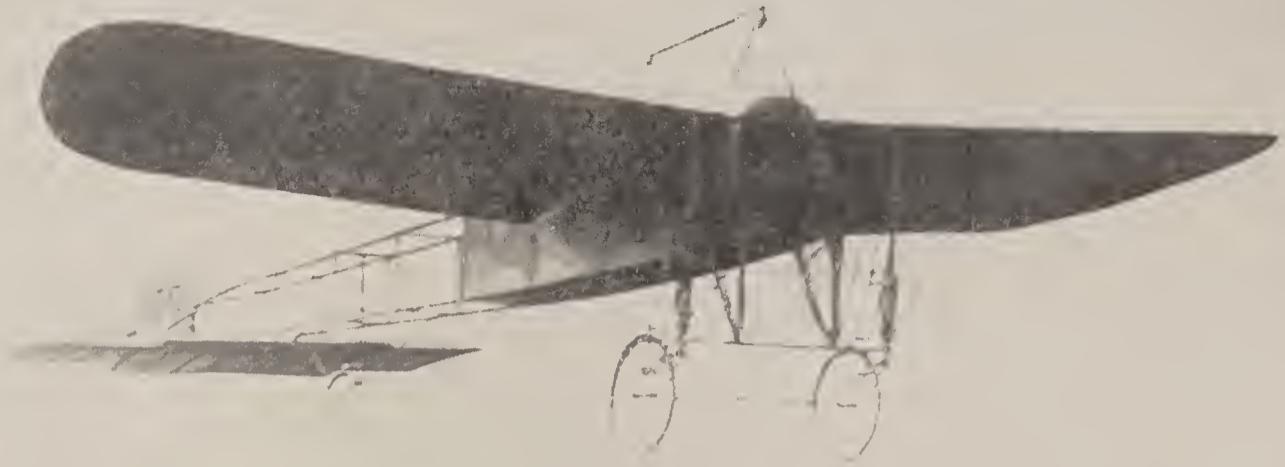
By the aid of an allotment of \$50,000 from the Board of Ordnance and Fortification of the United States War Department, a full-sized man-carrying aërodrome was constructed by Professor Langley and his assistant, Charles M. Manley, and tested in 1903. Its failure, due to defects in the launching mechanism, was a source of keen disappointment to many who had believed that in the aërodrome Professor Langley would solve the problem of mechanical flight. The aërodrome had a sustaining surface of 1040 square feet and with the aëronaut weighed, when ready for flight, 830 pounds. The gasolene engine, which was able to furnish 52.4 brake horse-power, weighed, without fuel or water, 2.2 pounds to the horse-power approximately. The engine to this day remains a marvel of lightness. The unsuccessful character of two trial flights made in 1903 did not demonstrate that the engine was unable to lift the machine, as the mishaps on both occasions were due to the apparatus catching on the launching apparatus, and this in the second instance resulted in the wreck of the machine.

According to Professor Langley, the ability of the aërodrome to fly was still unsettled, though it could not be considered a failure in this respect. The government refused to extend further aid. Hence no further developments of the aërodrome were made by Professor Langley before his death. The correctness of his reasoning and deductions, as well as his fundamental ideas, has been shown in subsequent work, and his studies and experiments have become recognized aëronautical classics.

Critical examination of Professor Langley's plans in the light of modern knowledge and experience has shown that his aëroplane "had every equipment needed for a steady flight of many hours in fair weather." Thus wrote Dr. A. F. Zahm, a recognized authority in aviation, and he added: "Professor Langley had, in 1903, a dynamic aëroplane quite the peer in many respects of the best that were developed during the first decade of aviation, and a mere accident, which should be expected in such complex experimentation, deprived him of the credit of the first man-flight on an adequately controlled and powered machine."

In this connection the work of Clément Ader, a French inventor, also should be mentioned, for by Frenchmen he is sometimes given the credit of having been the first to navigate the air in a dynamic flying machine, although at the time his man-carrying bird failed either to arouse much interest or to gain recognition in France. This ingenious worker first studied the anatomy of birds. In 1890 he completed a bird-like monoplane driven by a 40 horse-power steam engine with a screw propeller in front of the machine. On October 9 he is said to have risen in the air and flown for a distance of 150 feet with this machine and with a second and similar aëroplane to have made a flight of 300 feet on

AÉROPLANES



Photographs by Edwin Levick, N. Y.

TELEPHOTIC VIEWS OF AÉROPLANES IN FLIGHT.

1. Bleriot Mono-plane
2. Wright Machine. Improved Type, 1910
3. Curtiss Bi-plane

one occasion. In 1897 a larger machine was completed in the form of a bat with folding wings, spreading 270 square feet. It was driven by a 40 horse-power steam engine driving twin screws in front. The engine weighed about 280 pounds, or 7 pounds to the horse-power produced. In preliminary tests the aëroplane and engine worked satisfactorily, but the machine was able merely to leave ground. On the final test the aëroplane operating in the face of a severe wind was seriously damaged, and the able inventor was then unable to find the further support which his experiments clearly merited. Subsequently this machine was resurrected and was honored by exhibition at the Aëronautical Salon of 1908 at Paris. It has since been given a permanent place in the Conservatoire des Arts et Métiers.

Aside from the work of Maxim, Langley, and Ader, valuable experiments with large aërocurves and aëroplanes capable of carrying one man but without propelling motors and screws were conducted by Otto Lilienthal of Germany, Octave Chanute, an American engineer, and subsequently by the Wright brothers, of Dayton, Ohio.

With the machine shown in the illustration Lilienthal, starting from a height, was able to sail several hundred feet—the flight in some instances being against a wind of 24 miles per hour—and to make turns to the right or left with considerable certainty. Lilienthal began his flights in 1891. After making 2000 flights he was killed in 1896 in a biplane glider. Although he was an engineer, the trussing between the wings was very weak. Mr. Chanute's experiments were conducted first with a machine like Lilienthal's but with one pair of wings only; later, with a machine having five pairs of wings, one above the other, and a sixth pair forming a tail, and finally, with a machine consisting of two wings, one above the other, and without any break in the middle, as shown in the first of the two illustrations of his apparatus. His last model was a large bird-like structure of the form shown in the illustration. The greatest success, perhaps, must be credited to the double-decked machine, which made numerous flights, some of them against winds of from 10 to 31 miles per hour. The longest flight made was 359 feet, from a starting point 62 feet higher than the point of landing. This was in 1896 and showed that a trussed biplane used as a glider was reasonably safe. Mr. Chanute in the construction of this biplane glider was assisted by A. M. Hérring.

The curved surfaces of Lilienthal and his contemporary experimenters were found less satisfactory than planes, and the most efficient arrangement proved to be a pair of narrow superposed rectangles. Superposition of surface was first practiced by Wenham in the early sixties and copied by Lilienthal and Chanute. Working with apparatus similar to that tested in gliding flights by Chanute, whose advice and assistance they enjoyed, Messrs. Orville and Wilbur Wright, of Dayton, Ohio, in a long series of practical experiments by which great dexterity of manipulation was obtained, were able to construct a machine with a front rudder, in which the operator occupied a horizontal position. After many glides and after testing many forms and designs, a machine eventually was devised, to which a 16 horse-power four-cylinder gasolene motor and twin propellers were fitted. In this

a movable or elevating rudder was placed in front, and the wings could be warped for transverse control. This machine, which weighed a little over 200 pounds, was tested on Dec. 17, 1903, at the Kill Devil sand hills near Kitty Hawk, N. C., and four successful flights were made, in one of which the aëroplane rose of its own power, was in the air 59 seconds, and traveled a distance of 852 feet. This is the first instance where a person has been carried from ground in actual flight by mechanical means without artificial aids. Such success naturally led to other experiments, and on Oct. 5, 1905, the aëroplane made a flight of 24¼ miles, remaining in the air 38 minutes and 3 seconds. It was able to carry fuel for an hour's run and was able to move at a speed of about 38 miles an hour. It was maneuvered readily and was entirely under the control of the operator, being brought back to the starting point without difficulty.

Field trials of the Wright aëroplane were then suspended while the patent rights were being exploited and protected. In the summer of 1908, the Wrights having sold the patent rights for France, Wilbur Wright gave in that country a number of public exhibitions in which the superiority of the Wright biplane over contemporaneous French machines was clearly demonstrated. Simultaneously in America, Orville Wright demonstrated before the Signal Corps of the United States army an aëroplane consisting of two superposed main surfaces aggregating about 500 square feet and spaced 6 feet apart. The two planes had a spread of 40 feet and were 6½ feet front to rear. A horizontal rudder of two parallel planes was placed in front, while a vertical rudder was carried at the rear. A 4-cylinder gasolene water-cooled motor developing about 25 horse-power when working at 1400 revolutions per minute drove two wooden propellers, each 8½ feet in diameter and making 400 revolutions per minute.

Successful trials of this machine at Fort Myer, Va., were interrupted by an accident, Sept. 17, 1908, in which Orville Wright was injured and Lieut. T. E. Selfridge, U. S. A., was killed. One flight at these trials lasted for 1 hour 14 minutes and 20 seconds, and an estimated speed of 40 miles an hour was obtained. In the following year the aëroplane was duly delivered to the United States army and accepted. Its use was taught to several officers. See MILITARY AÉRONAUTICS.

In France Wilbur Wright aroused the greatest enthusiasm by the duration and speed of his flights, securing one prize and record after another. Such demonstrations, involving flights up to 77 miles in extent and 2 hours and 20 minutes in duration, proved that mechanical flight for machines heavier than air was assured, and the training of aviators proceeded at a rapid rate. From this time on improvements in design and construction of the Wright machines were effected. In 1910 the front rudder was done away with, because it was found that it caused pitching. Instead of starting the machine on an inclined rail, bicycle wheels were employed so that ascents could be made from the ground—a method long before adopted by others.

The first patents awarded to the Wrights were sufficiently broad in their scope to protect the invention. Infringements followed giving rise to extensive litigation. In a decision handed down by Judge John R. Hazel in the United States

District Court on Feb. 27, 1913, the Wright claims in the main were upheld, the Court holding that while the elements in the Wright aëroplane were conceded to be old the inventors were the first to discover that the vertical rudder of a flying machine must be used in conjunction with wing-warping devices, or ailerons, to prevent the machine from spinning on a vertical axis in straight-away flight. Decisions in favor of the Wrights were made also in Germany on February 26, and in France on February 28, of the same year in which their claims were largely sustained.

The announcement of the first successes of the Wright brothers, as well as an increased interest in aëroplanes among disciples of Lilienthal and others, gave rise to much experimentation. In England Horatio Phillips, in 1904, a few months after the initial success of the Wrights, flew across a field in a gasoline-driven multiplane mounted on wheels. But it was in France that there was the greatest enthusiasm, and this led, in 1906, to activity among French workers in this field, and valuable cash prizes and trophies were offered for flights. In France, especially, the light-weight gasoline motor of high efficiency and power, as used on motor cars and motor cycles, had been highly developed so that no longer experiments in gliding flight from elevations were in order, as there were available sufficiently powerful motors to operate aërial propellers.

In 1906 Santos-Dumont turned from his dirigible balloons to a new form of aëroplane which was the first practical aëroplane publicly to be shown. This machine consisted of a frame carrying a cellular structure with a box rudder in front at the end of a vertical vane. On Aug. 22, 1906, he made a successful though short trial flight, but in the following month the machine collapsed, and the aviator narrowly escaped. In subsequent tests on November 12 a flight of 215 meters (715 feet) was made, thus gaining the prize of 1500 francs of the Aëro Club of France for the first public flight of 100 meters. Santos-Dumont in 1909 evolved a monoplane with the least weight (242 pounds) and the smallest supporting surface (115 square feet) of any machine constructed up to that time. Its low centre of gravity, however, caused it to oscillate like a pendulum and made it hard to control. The type was soon abandoned.

Sharing the early honors with the Wright brothers' aëroplane, was the biplane of Glenn H. Curtiss, who had been an inventor and manufacturer of motor cycles and held several speed records with machines of his own design and construction. After making several aëroplanes during the spring of 1908 Mr. Curtiss developed a type of biplane driven by one high-speed propeller which depended for its stability on movable ailerons or tips placed at the extremity of the supporting plane. This machine on July 4, 1908, won for the first time the *Scientific American* trophy with a flight of over a mile. A second machine improved this performance, and in 1909 a Curtiss machine was entered in the great international competition at Rheims, France, and won the Gordon Bennett aviation prize for the fastest time (15 minutes 56½ seconds) over a distance of 20 kilometers (12.42 miles). In 1910, on May 29, he flew from Albany to Governor's Island, N. Y. Harbor, a distance of 142 miles, stopping but three times to replenish oil and fuel, at an average rate of

about 49 miles an hour. Charles K. Hamilton in the same year, using a Curtiss aëroplane, made an even more noteworthy flight from Governor's Island to Philadelphia and return, doing the air-line distance of 74.7 miles, or over 82 miles as flown, in 1 hour and 45 minutes, or about a rate of 45 miles an hour.

The Curtiss aëroplane was now recognized as a standard type, and its manufacture on a large scale was undertaken. Its usefulness was increased, however, by its application to over-sea flight in the form of the hydroaëroplane devised by Curtiss in 1910, described a few paragraphs below. In 1912 Curtiss was voted a "Langley Medal," the second to be awarded, by the Regents of the Smithsonian Institution for "specially meritorious services in connection with the science of aërodromics." He also received the medal of the Aëro Club of America.

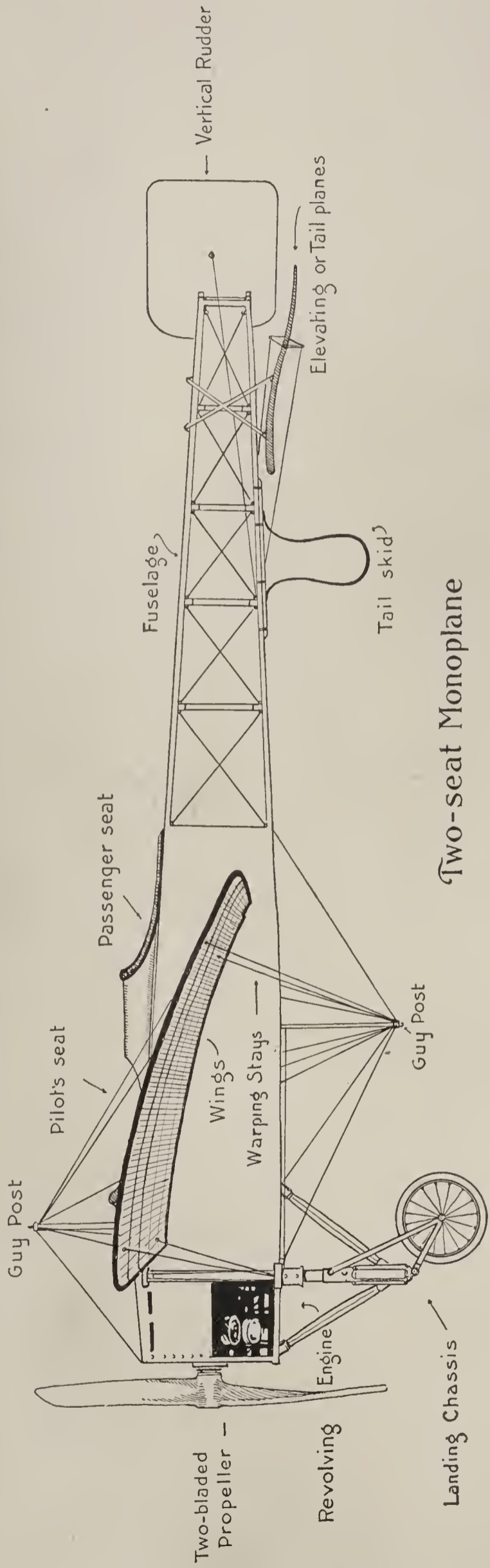
The success of the Wrights in France was followed by that of Henri Farman, who in 1907 had flown a Voisin cellular biplane with two curved parallel surfaces. In construction the machine resembled both the Chanute glider and the box kite of Hargrave (see KITE) which had exerted considerable effect on aëroplane design. It was the first machine to be fitted with wheels for convenience in rising and landing. It was the first machine in France to fly a sufficient distance to win various prizes offered for practical flight. Later Farman struck out as a designer himself and gave the world a biplane which, while it owed much to the Wright brothers, nevertheless displayed considerable originality of design. It was for some time a leading type.

Other notable French biplanes were those of Breguet and Sommer, to mention but a few of the different types that were soon developed. In England there were the biplanes of Cody and Dunne and others patterned more or less closely on French and American models, although Dunne's system of inherent stability is distinctly original. Later in the United States the Burgess biplane, a modified Wright type, was developed in the form of a so-called Military Tractor, and in 1913 four machines were constructed for the Signal Corps of the United States army. It was the first enclosed body tractor to be built in the United States, a covered fuselage containing the motor, aviator, and observer.

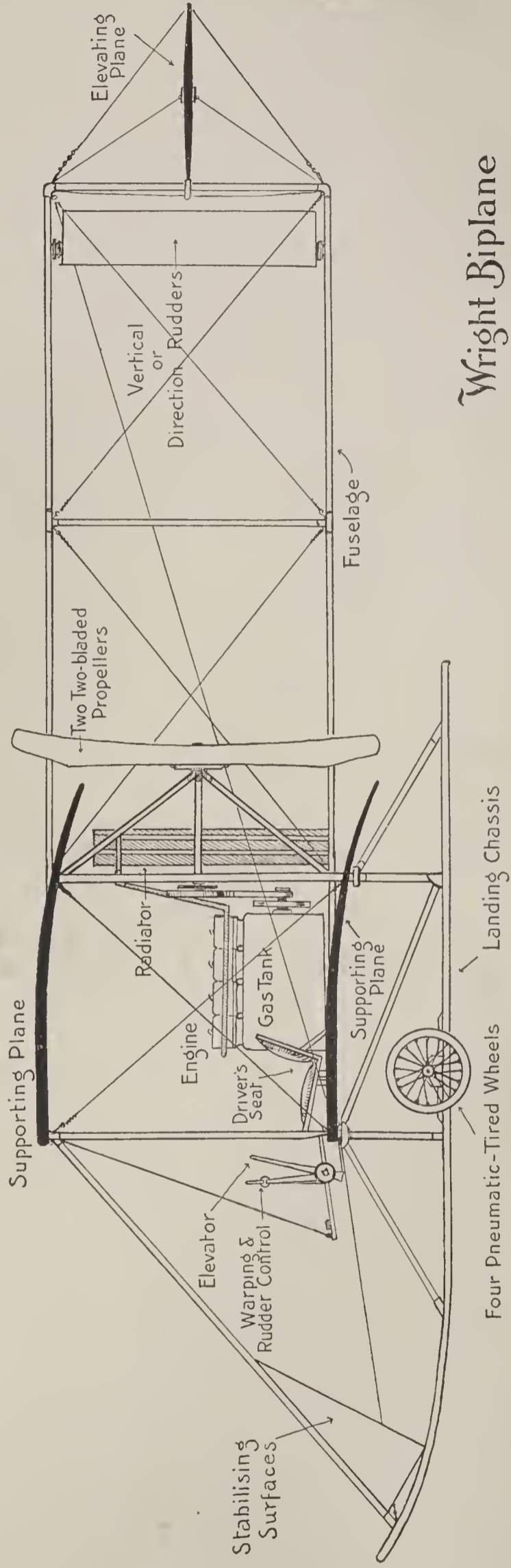
Monoplanes. By 1908 it was realized that a successful aëroplane with a single supporting surface was possible, and for some purposes preferable, and one designed by Louis Blériot on Oct. 31, 1908, made a successful flight from Chalons to Rheims, a distance of 17 miles. It also figured in the international competition at Rheims. This type of machine had made the first flight for an aëroplane across the English Channel from Baraques to Dover on July 25, 1909. The success of the Blériot machine established the type, and it soon became but one of a number of machines of this type which flew with success.

Blériot's monoplane, as finally brought to a successful point of development in 1908, consisted of a long central trussed structure or spine, mounted on wheels and carrying at the front the propeller and motor and at the rear two of the rudders for direction and elevation. The direction of the machine to right or left was effected by a vertical rudder at the rear, while a horizontal rear rudder served to control

AÉROPLANES



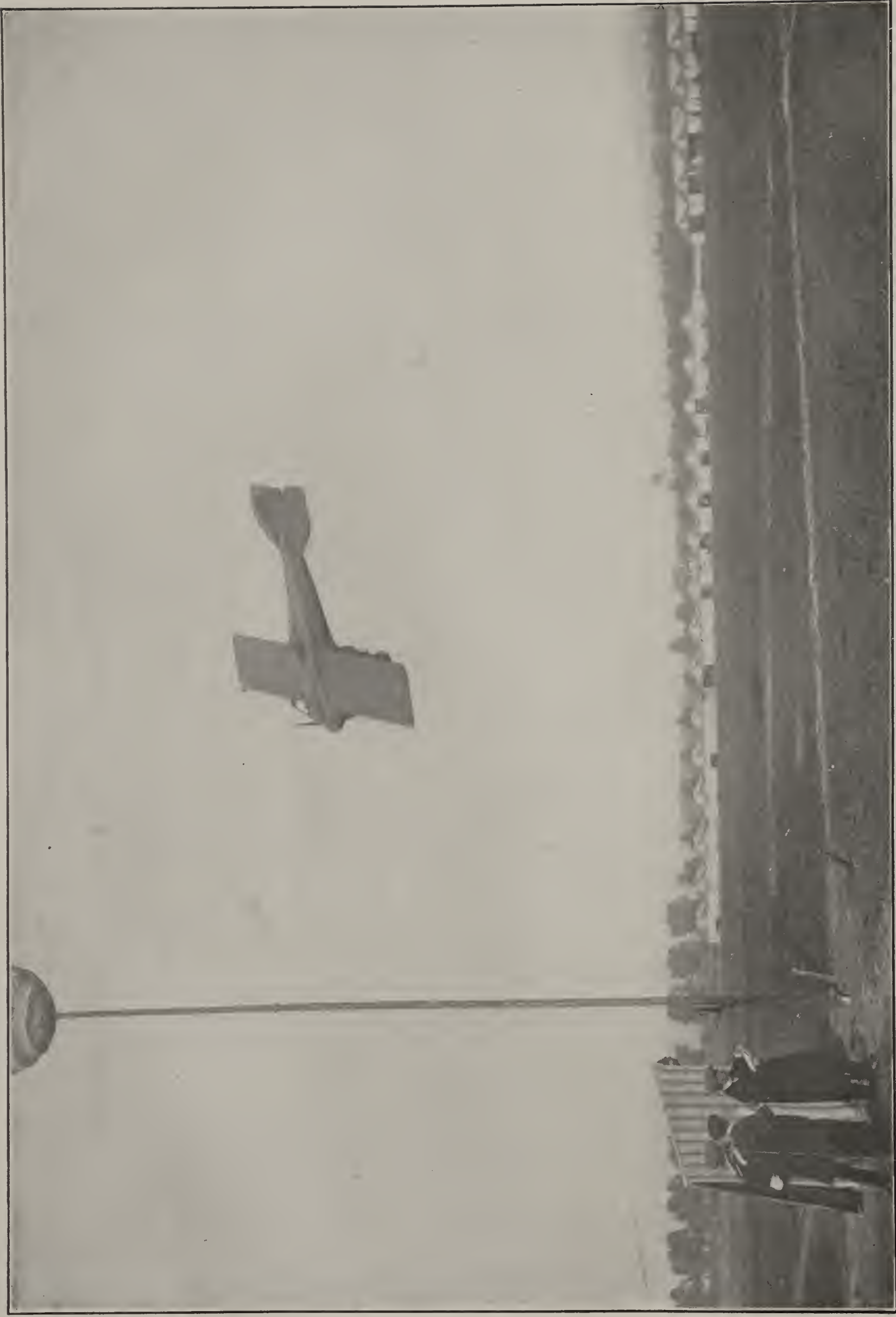
Two-seat Monoplane



Wright Biplane

A TYPICAL MONOPLANE AND BIPLANE.

AÉROPLANES



A HIGH-SPEED MONOPLANE IN FLIGHT

A DEPERDUSSIN MONOPLANE WITH 160 HORSE-POWER ENGINE, PILOTED BY MAURICE PREVOST, IN THE GORDON BENNETT CUP RACE OF 1913
The photograph was taken when the speed of the monoplane was over 124 miles an hour.

elevation and pitching. The lateral rudder was placed at the wing terminals, and lateral stability was obtained by warping or bending the edges of the main wings, after the Wright principle. The supporting surface was firmly attached to the central frame, which was covered to diminish the atmospheric pressure against the framing and engine as well as the body of the aviator. The monoplane, as thus developed by Blériot, straightway became a competitor of the biplane and served as a point of departure from which much successful designing was done, involving of course more or less radical variation from the original model. The power of the engine was materially increased, and this naturally involved increase of structural strength.

But Blériot was by no means the only successful designer of monoplanes. Immediately there were a number of machines with greater or less divergence in design and construction among themselves, but in the main embodying in common most of the essential characteristics. Nevertheless different designers and makers had often secured individual features that worked for efficiency, so that there were evolved a number of types. Thus the *Antoinette* brought out in 1909 by Levavasseur and flown by Latham, was a monoplane with a polished inclosed body or fuselage, so shaped that it bore a striking resemblance to a fish. Despite its graceful form, it ultimately gave way to the more efficient models of other makers. The Nieuport machine (extraordinarily successful in 1911), the Deperdussin (a machine of high mechanical excellence despite the subsequent misfortunes of its ill-fated promoter), the Hanriot, the Esnault-Pelterie, the Morane-Saulnier, and other monoplanes developed in France figured in various flights and competitions and acquitted themselves with merit. In Germany, Austria, Great Britain, and to a less extent the United States, other monoplanes were developed, but, save for that of Igo Etrich, the Austrian, whose machine has a bird-like tail, the differences for the most part were minor.

At first it was claimed that the monoplane, while speedier for short distances, was less stable and incapable of sustained flight or ability to endure varying conditions of the air. This, however, was soon disproved, and many notable distance and endurance records were made with monoplanes. The biplane, however, seemed to have greater lifting power and was used in the various types of hydroaëroplanes.

All aëroplane construction became an engineering matter, based not only on experience and originality of conception, but on technical study to evolve safer, more powerful, and generally more efficient machines. Careful attention to sound principles and details figured more than ever in design and construction, and from the mechanical standpoint few departments of engineering have ever boasted more rapid or satisfactory progress.

The year 1909, which has been mentioned for several achievements, was an important one in aviation. Up to this time America and France had enjoyed practically a monopoly of the design and construction of aëroplanes, but now other nations and especially their armies became aroused at the wonderful developments of mechanical flight and its future possibilities. From this time other countries were represented at the various aviation meets, and aëroplanes were purchased, chiefly from France and Germany,

for use in nearly all of the European countries. At the famous meeting held at Rheims, France, in August, 1909, 36 aëroplanes competed, and notable speed and endurance records were made. Aviation meets and exhibitions soon became general, and wonderful performances which aroused wide interest took place, as the aviators secured increased command of their machines and engines and planes were perfected. In the following year came increase not only in speed but in distance and duration. Cross-country records and flights now began to take the place of the shorter speed contests, the general process being much the same as in the case of the automobile, where track racing was succeeded by long-distance road competitions.

Thus Farman, who in Jan. 12, 1908, 19 months previously, had won a prize of \$10,000 for a flight of 1 kilometer (.621 mile), now won the same amount by doing 190 kilometers (118.06 miles) in 3¼ hours in his biplane. The speed record for 10 kilometers, 15 minutes 50¾ seconds, or an average speed of 47.04 miles an hour, went to Curtiss, who in a biplane defeated Blériot in a monoplane. In short, the development of the aëroplane was now rapid and pronounced. The number of aviators increased, valuable prizes were offered for long-distance flights and for competitions, and various improvements suggested by the practical experience of the aviators no less than of a mechanical character were made.

It is true there was a long annual record of accidents and fatalities, resulting for the most part from defective construction or unskilled operation or to extra-hazardous performances at public exhibitions. At the same time, considering the length and duration of flights in the aggregate and the number of aviators, there was a striking decrease in the relative number of accidents from time to time. This was due in large part, not only to improved machines, but to great skill on the part of the aviators. Indeed, during the opening years of the development of aviation this personal element of the pilot was most important in successful flight.

Nevertheless it was soon recognized that automatic stabilizing devices must be provided to secure greater safety and to diminish the difficulties of control. Many accidents were attributed to faulty stability. Maxim early suggested the use of the gyroscope (q.v.) for this purpose of relieving the aviator of the strain of maintaining stability; and various inventors endeavored to use the same principle in one form or another. Elmer A. Sperry, who had attacked the problem of the stability in ships by the use of various forms of gyroscope, developed an automatic control for aëroplanes in which the elevator and ailerons were moved by compressed air valves controlled by two small gyroscopes weighing but 2¼ pounds each and operated electrically from a dynamo connected with the engine. This form of control served to keep the aëroplane on an even keel automatically and also acted to secure automatic banking in making turns while in flight. It was used with considerable success in 1913 on the Curtiss biplane.

In addition to the gyroscope the pendulum principle was also utilized, and a pendulum seat worked well under certain conditions in an aëroplane of the Moreau brothers and also in a Sommer machine, both of French construction. The Wrights had patented a pendulum control

for their biplane and had confident hopes of its success. Interesting, too, is Doutré's device for controlling fore and aft stability.

Aside from securing stability automatically by such mechanical devices, attention was being paid to the design of the planes themselves with this end in view and in methods of operation in flight. Thus Igo Etrich, an Austrian inventor, whose monoplane was brought out in 1910, used flexible wing tips and trailing sides like a bird's tail, while Lieutenant Dunne in England, in a notable self-balancing biplane finally brought out in 1913, secured great stability—in fact, sufficient, it was claimed, to make flights of an hour or more without human control—by building his aëroplane of a V-shaped plan with the apex in front. There was no rudder or tail, the wings sloping towards the rear in an inverse curve and maintaining a constantly varying camber from the apex of the V to the ends of the wings, which were set at a dihedral angle. Another plane that afforded stability was that of Drzwiecki, developed as a result of tests and experiments made in M. Gustav Eiffel's laboratory. This went back to the original Langley principle and consisted of an aëroplane with two sets of wings arranged tandem, the following surfaces as well as the forward planes being set at a dihedral angle.

In the development of the aëroplane, and particularly of the monoplane, every element has been and must be carefully considered. In the construction, wherever possible, steel and aluminium have taken the place of wood. The newer alloy steels with their greater strength and lightness were employed as soon as their usefulness was demonstrated on test.

It did not take aëroplane engineers long to depart from the early motor-cycle or automobile type of motor and develop a machine specially suited to their special needs; and in fact on its ability to run for long periods without attention and with absolute reliability depend such future achievements as a transatlantic trip. Aëroplane motors may be either rotary, as the Gnôme, a famous motor which has figured in many successful aëroplanes, or some form of motor with from four to eight or more cylinders where the pistons, arranged vertically, opposed, radially, or at an angle, work directly on the crankshaft. These are either air-cooled, as in the case of the Gnôme and Esnault-Pelterie, or water-cooled, as in the Curtiss and Wright.

With a fuller knowledge of the conditions naturally it was possible to design motors and planes for specific uses. Thus a machine to develop a speed of 100 miles an hour and over would be differently engined and designed from one where long-distance flying was the main object and all conditions of weather were likely to be encountered. It is in this latter respect that the most notable achievements have been secured and where further progress is likely to arouse the greatest interest as well as work for the greatest good. Consequently more important than mere speed records are those for cross-country flights, a noteworthy example of which was that of Brindejone des Moulinais, started on June 10, 1913, and lasting until July 2, in the course of which over 3000 miles were accomplished. This trip, extending from Paris to St. Petersburg and return, was made in a Morane-Saulnier monoplane equipped with a Gnôme 80 horse-power motor.

Brindejone's entire trip, as an achievement

and as illustrating the state of the art at the time it was made, is worthy of consideration aside from its first stage. The complete schedule was as follows:

June 10	Paris to Warsaw	875 miles
15	Warsaw to Dvinsk	344 "
16	Dvinsk to St. Petersburg .	281 "
23	St. Petersburg to Reval . .	219 "
25	Reval to Stockholm	250 "
29	Stockholm to Copenhagen .	344 "
July 1	Copenhagen to The Hague	449 "
2	The Hague to Paris	240 "
		—
		3002 "

It will appear from the above itinerary that the aviator traveled across long stretches of water and many kinds of country. His stays were often of several days' duration, so that the time of flight could have been reduced materially.

Speed Records. The increase in speed developed by the aëroplane in successive years already has been indicated, but it is best shown in the records of the Bennett cup competition, which began in 1909. In that year the trophy was won by Glenn H. Curtiss with an average speed of 47.04 miles an hour in a biplane. In 1910 Grahame-White with a Blériot monoplane made the 100 kilometers in 1 hour 1 minute $4\frac{3}{4}$ seconds, or at a speed of 61 miles an hour, which represented a gain of 30 per cent over the average of Curtiss; and while these were not the best records of the two years, yet they show very well the proportionate gain. In 1911 the 150 kilometers were accomplished by C. Weymann in a Nieuport monoplane in 71 minutes 36.5 seconds, or 78.728 miles an hour, or an increase of 29 per cent over the previous year. In 1912 Jules Védrines in a Deperdussin monoplane won over a 200-kilometer course with a flight of 1 hour 10 minutes 56.85 seconds, or at an average speed of 105.04 miles an hour, a gain of 33.2 per cent over 1911. These also were not necessarily the best speed records of the years mentioned, but they stand on a comparable basis. The best official speed record of 1912 was made, however, by Védrines at Chicago on September 9, after the Bennett cup competition, and was 107.4 miles an hour. In 1913 Maurice Prevost in a Deperdussin monoplane at the aërodrome at Rheims made a notable flight at the Bennett cup competition on September 29. He went over the 200 kilometers (124 miles) in 59 minutes $45\frac{3}{5}$ seconds, or an average speed of 124.5 miles an hour, making new records for all distances from 10 to 200 kilometers. All four competitors in the 1913 event flew at a rate well in excess of 100 miles an hour.

Altitude Records. The ability of the aëroplane to ascend to extreme heights of the atmosphere is of considerable significance, as it is more than a feat of mere daring on the part of the aviator and his ability to withstand cold and rare atmosphere. For the engine there is required more power to advance and raise the plane in the rarer atmosphere than at lower levels, while to ascend to great heights the machine must be carefully maneuvered. Consequently increase in altitude indicates progress in aviation, and this was strikingly illustrated in the progress from the year 1909, when the record stood at 1473 feet, to 1910, when, on January 7, Latham in an Antoinette monoplane rose at Bethény Plain to a height of 3445 feet.

On December 9 of the same year this record was raised by Legagneux in a Blériot monoplane at Pau to 10,499 feet. But this was by no means the end for the spiral soaring aviators, and by Dec. 11, 1912, Roland Garros at Tunis, Africa, went up to a point 19,032 feet, while, March 14, 1913, Perreyon in a Blériot monoplane went to a height of 19,650 feet. Various other records have been made with passengers in addition to the pilot, and this ability to soar is of particular value in the military use of the aëroplane, for it enables the machine to remove itself from range of fire on the earth.

Aëroplane Carrying Capacity. In 1908 Delagrangé, who had been in competition with Farman, carried the latter aloft and thus made the first ascent on record of two men in an aëroplane. In the following year Farman made an ascent with three passengers, and since that time the weight-carrying capacity of aëroplanes has been greatly extended, so that as many as 12 passengers have been carried for short periods. Passenger-carrying machines are even made with inclosed cars, and adequate protection for aviator and passengers has become a feature of even the smaller cars.

HYDROAËROPLANES

An important development of the aëroplane, and one destined widely to extend its use, was the hydroaëroplane designed to rise from the surface of water and to alight thereon. Not only is this type virtually a flying boat, but it is one that is reasonably safe. The idea, which had been suggested in patent specifications by Hugo Matullath of New York in 1899, had its practical origin in Curtiss, who added to the aëroplane with which he was experimenting at Lake Keuka in 1908 floats placed under each wing so that in case of accident the machine would not sink but could be reached and saved readily with a boat. In fact, it will be recalled that Langley and other inventors for like reasons made their experimental flights over bodies of water. Probably the first to add the floats as an integral part of the machine with the express idea of rising from the surface of the water was Fabre, who on March 28, 1910, made the first flight with a practical hydroaëroplane at Martigues on the Seine, France. His machine was a monoplane to which were fitted three floats, so that he was able to ascend and descend at will on the surface of the water. In the meantime Curtiss, who had been working at San Diego, Cal., on aëroplanes for the United States navy, developed a hydroaëroplane which was shown on Jan. 26, 1911. This was a biplane with floats instead of the usual landing skids, but provided, however, with wheels for use on land. Various arrangements of floats were tried, and the machine straightway commended itself to navy officers and a number of yachtsmen. Curtiss eventually abandoned floats and used a true boat body. Other designers are tending to follow in his footsteps. For this development of the hydroaëroplane Curtiss received the Aëro Club of America trophy in 1911, and in 1912 for the flying boat. The hydroaëroplane has aroused much interest, both in Europe and America.

By 1912 there was sufficient interest in the hydroaëroplane to warrant holding an international competition, and such a meeting duly took place at Monaco in March, seven biplanes

competing. The conditions of this competition as well as those of 1913 and succeeding years laid special stress on seaworthiness and practical performance and handling, not merely the development of high speed and the ability to rise from and above a perfectly smooth expanse of water. In other words, a distinct type of craft was being developed that would perform satisfactorily both above and on the surface of the water, that could be moored at anchor in fairly rough water, and that could be hoisted in or out of the water with an ordinary crane tackle in addition to traveling distances of as much as 300 miles in the air. This required a strongly built and framed aëroplane, well engined and embodying the best features of aëroplane construction, together with a suitable hull or floats. Another notable American machine was the Burgess-Curtiss hydroaëroplane, which was brought to a high degree of perfection and secured recognition in the American military and naval service. The Wright company in 1913 also brought out types of hydroaëroplane developed from their standard aëroplanes.

The hydroaëroplane presented nautical possibilities and problems almost as important as those of an aërial nature. Thus, by the use of a drag in a rough sea, as was done at the Mediterranean competition, the position of the aëroplane may be maintained. The attention that was paid to the hydroaëroplane by naval authorities showed how important an aid it was in various schemes of offense and defense. Furthermore, the possibilities of such a machine for sport similar to yachting and motor-boating were considered as far more appealing than the smaller and more rapid aëroplane.

The hydroaëroplane had also an effect on aëroplane construction and design by bringing about even stronger construction and greater power. It was early realized by aëroplane designers that once the practical aëroplane was secured extreme lightness at the expense of strength or other essential features was in no way desirable, and with the increased use of metal naturally came increased weight. Now with the hydroaëroplane, in which the principle of safety was carried even further than in previous aëroplane construction, there was added the desire to secure carrying capacity. All the American and European hydroaëroplanes are more and more designed for carrying capacity as well as strength both of the planes and of the hull or floats. Several other points in this connection could be mentioned also, but reference should be made to the compact arrangement of the engine in the cockpit with an accessible starting device and the placing of the propeller behind the pilot.

Crossing the Atlantic. The status of aviation was indicated in the spring of 1913, when Lord Northcliffe, of the *London Daily Mail*, offered a prize of \$50,000 for the first transatlantic flight from the United States, Canada, or Newfoundland to Ireland or Great Britain by an aëroplane in 72 hours. The conditions permitted alighting on the water or taking in fuel on the way, so that obviously some form of hydroaëroplane would seem the most promising. Were an aviator absolutely sure of the performance of his motor and suitable or at least constant weather conditions, there would have been little difficulty in accomplishing the feat, even at the time the prize was announced, and with the development of the hydroaëroplane

which could rest on the surface of the waves such a feat would seem to be possible. Thus the aëro-yacht biplane of M. Deutsch de la Meurthe had a carrying capacity of over 6000 pounds, and showed a speed of 68 miles an hour. If the place of the six or eight passengers ordinarily carried was occupied by fuel, the craft would have considerable radius of operation. Some such machine, even in the present state of aircraft, surely can be designed to overcome the difficulties.

Applications. Although the aëroplane, both as regards its design and construction, has progressed rapidly, outside of military and sporting purposes there has been but little application or even indications of its general and practical utility. For military uses the aëroplane is indeed a valued aid, and its utilization for scouting and reconnaissance as well as for offensive purposes followed almost immediately upon its construction in a practical form. (See MILITARY AËRONAUTICS.) In fact, it was in such demand after the first excitement attending aviation exhibitions as a novelty had worn off that an aëroplane-manufacturing industry was established, an industry which flourished in proportion to the interest taken in military aëronautics. For the rapid delivery of mail or express parcels, especially over long distances and mountains, there was believed to be a field for the aëroplane, and it was specially recommended for Alaska, but, all things considered, this is naturally restricted. Whatever mechanical triumphs have been scored with the aëroplane as yet, none have been economic. So far it has failed to develop commercial uses or even indicate clearly commercial possibilities. In large measure this is due to the fact that there is no demand for more rapid communication or transportation than can be supplied by modern railways and steamships supplemented by the telegraph and telephone. The limited carrying capacity of the aëroplane compared with the dirigible, for example, further restricts its use, and the desire for flight now able to be gratified does not seem to be widespread and general, largely because the machine cannot be regarded as a very safe form of vehicle. Nevertheless aircraft undoubtedly has a bright future, and with economy and efficiency will come increased carrying capacity that may soon bring about the aërial age.

Aëronautical Institutes. It was early realized that aërial navigation involved theoretical study and calculation as well as careful and elaborate experimentation no less than any other branch of physics or engineering. Accordingly there were established laboratories where experimental facilities were available and where technical researches could be carried on effectively. The first aëronautical laboratory was organized in France by Capt. (later Col.) Charles Renard at the Central Establishment for Military Aëronautics at Chalais-Meudon, near Paris, about 1884, when the experiments with the balloon *La France* were in progress. Later, experiments were undertaken with lifting screw propellers. In more recent years another French aëronautical laboratory was that founded by the French civil engineer, Gustav Eiffel (q.v.), who became interested in problems of aërial resistance by experiments with falling bodies released from the top of the famous tower he had designed and built. This work, carried on in 1903 and 1906, led to his building

a well-equipped laboratory, one feature of which was an elaborate wind chamber. Several volumes involving the results of M. Eiffel's notable investigations in this field have been published. A third French aëronautical institute is that founded by M. Deutsch de la Meurthe at Saint-Cyr with an endowment of \$100,000, and known as the Aërotechnical Institute of the University of Paris. In Germany there is an aëronautical laboratory and special department in the University of Göttingen, under the direction of Professor Prandtl, while in Russia there is the Aërodynamic Institute of Koutchino, founded in 1904 in connection with the University of Moscow by M. Raboutschinski. The British National Physical Laboratory at Bushy Park near London has an aëronautical department with extensive experimental facilities. In the United States authorization was given by the Board of Regents of the Smithsonian Institution on May 1, 1913, to reopen the Langley Aërodynamical Laboratory and to appoint an advisory committee and to arrange additional laboratories and to form them and other existing agencies into a special bureau. It is the function of this bureau to carry on theoretical and experimental investigation to increase safety and effectiveness of aërial locomotion for the purpose of commerce, national defense, and the welfare of man. The advisory committee was appointed and approved by the President of the United States, and for the first year of the work there was available an appropriation of \$10,000 to be followed by \$5000 annually for five years. The United States Bureau of Standards, the United States Weather Bureau, and the War and Navy departments were all represented in the advisory committee and will put their facilities at the disposal of the workers in the bureau.

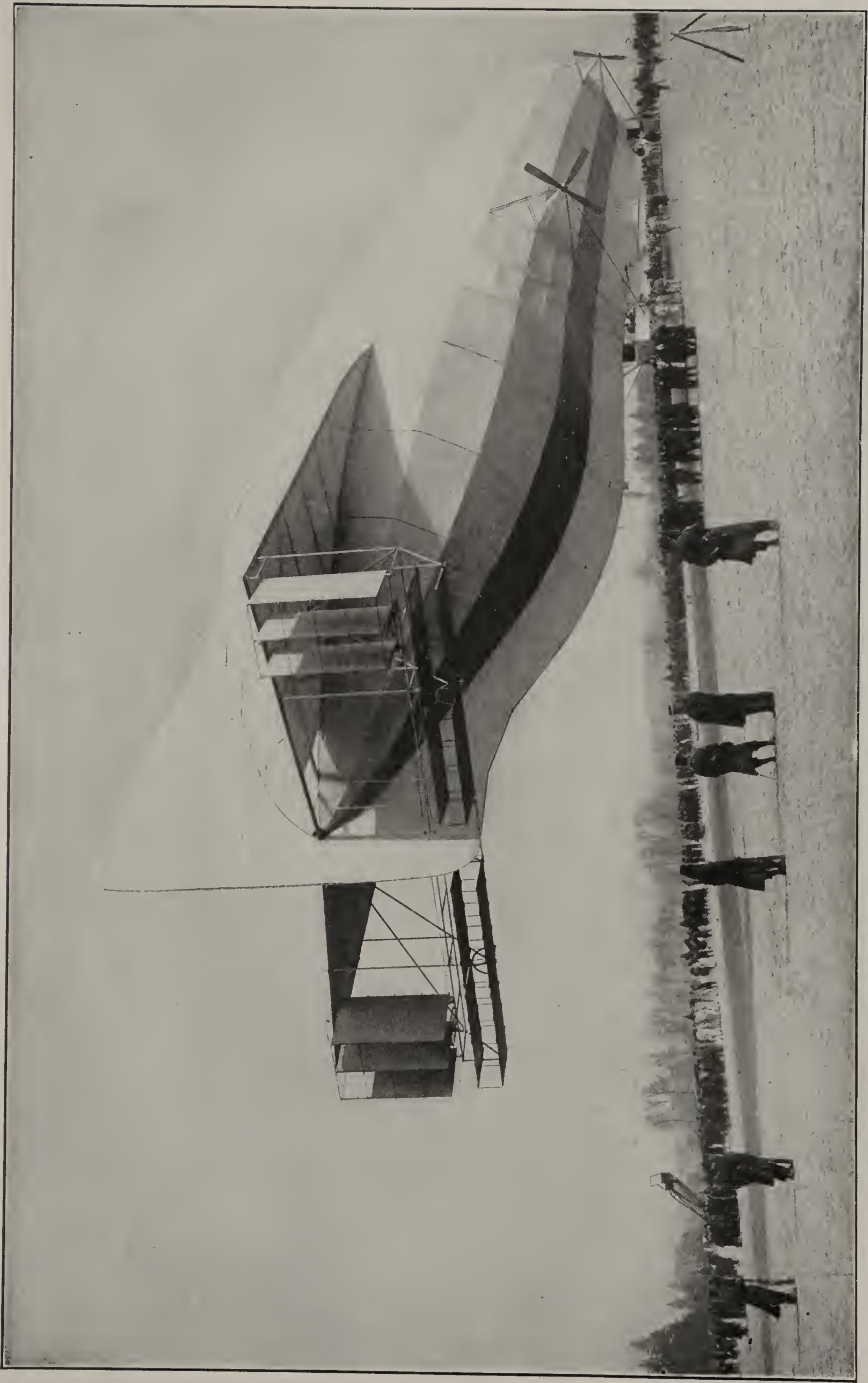
Bibliography. As most of those who made systematic balloon ascents and carried on experiments in aërial navigation and aviation have been either scientific or military men, there is a valuable literature which is available for reference. A complete *Bibliography of Aëronautics* by Paul Brockett was published in 1910 by the Smithsonian Institution, Washington. Some of the more important works generally accessible are: Hatton Turnor, *Astra Castra: Experiments and Adventures in the Atmosphere* (London, 1865); Glaisher, *Voyages aëriens* (London, 1871); Tissandier, *Les ballons dirigibles* (Paris, 1872); *Histoire de mes Ascensions* (Paris, 1879); *La Navigation Aérienne* (Paris); Coxwell, *My Life and Balloon Experiences* (London, 1888); Pettigrew, *Animal Locomotion* (New York, 1872); S. P. Langley, *Aërodynamics and Internal Work of the Wind*, Smithsonian Institution (Washington, 1891); id., *Smithsonian Reports* for 1903 and 1904 (Washington, 1904-05). The *Smithsonian Reports* contain valuable summaries of important aëronautical experiments; Lilienthal *Der Vogelflug, als Grundlage der Fliege Kunst* (Berlin, 1889), trans. *Bird Flight as the Basis of Aviation* (London, 1911); Octave Chanute, *Progress in Flying Machines* (New York, 1894); *Proceedings of the International Conference on Aërial Navigation*; Santos-Dumont, *My Airships* (New York, 1904); *The Aëronautical Annual* (London, 1895-97); *the Proceedings of the Aëronautical Society of Great Britain*; the *Balloon Society of Great Britain*; *Académie d'Aérostation* of France and the *German Aëronautical Society*; Hildebrandt (Eng.

HYDROAËROPLANES



1. CURTISS FLYING BOAT
2. BURGESS COAST DEFENSE HYDROAËROPLANE OF U. S. ARMY SIGNAL CORPS
3. WRIGHT HYDROAËROPLANE, MODEL C-H.

AIRSHIPS



A ZEPPELIN DIRIGIBLE AS USED IN PASSENGER CARRYING SERVICE

The three Airships, "Hansa," "Sachsen" and "Victoria Luise," each close to 500 feet in length, and capable of carrying as much as ten tons of merchandise, in a single year, 1913, carried 12,382 passengers for trips lasting as long as five hours.

trans. by Story), *Airships Past and Present* (New York, 1908); F. W. Lanchester, *Aërial Flight*, vol. i, "Aërodynamics" (New York, 1908); vol. ii, "Aërodonetics" (New York, 1909); Loughheed, *Vehicles of the Air* (Chicago, 1909); R. P. Hearne, *Aërial Warfare* (London and New York, 1909); The Aëro Club of America (collection of timely papers) *Navigating the Air* (New York, 1907); Sir Hiram Maxim, *Artificial and Natural Flight* (London, 1908; New York, 1912); Loening, *Monoplanes and Biplanes* (New York, 1911); Kaempffert, *New Art of Flying* (New York, 1911); Zahm, *Aërial Navigation* (New York, 1911); Rayleigh, *Mechanical Principles of Flight* (Manchester, 1899-1900; Curtiss and Post, *Curtiss Aviation Book* (New York, 1912); Turner, *Romance of Aëronautics* (New York, 1911); Hayward, *Practical Aëronautics* (Chicago, 1912); Grahame-White and Harper, *The Aëroplane, Past, Present, and Future* (Philadelphia, 1911); Brewer, *The Art of Aviation* (London, 1910); Duchêne, *The Mechanics of the Aëroplane* (Eng. trans. by Lederboer and Hubbard, London, 1912); Eiffel, *The Resistance of the Air and Aviation* (2d Eng. ed., trans. by J. C. Hunsaker, U. S. N., Boston and New York, 1913); Brewer, *The Art of Aviation* (London, 1913); Alexander, *Account of the Progress of Aviation* (London, 1913); Bauman, *Mechanische Grundlagen des Flugzeugbaues* (Munich, 1913); Berriman, *An Introduction to the Elements of Flight* (London, 1913).

Periodicals. Among the periodicals devoted to aëronautics whose files are most satisfactory sources of information on this subject, the best known are: *Flying and the Aëro Club of America Bulletin* (New York); *Aëronautics* (New York); *Aircraft* (New York); *Fly* (Philadelphia); *The Aëronautical Journal* (London); *Aëronautics* (London); *Flight* (London); *The Aëroplane* (London); *L'Aëronaute* (Paris); *L'Aërophile* (Paris); *Revue Generale de l'Aëronautique* (Paris); *La Technique Aëronautique* (Paris); *Encyclopédie de l'Aviation* (Paris); *Deutsche Luftfahrer Zeitschrift* (Berlin); *Bolletino Della Societa Aëronautica Italiana* (Rome). See NAVIGATION, AËRIAL, LAW OF; MILITARY AËRONAUTICS.

AËRONAUTICS, MILITARY. See MILITARY AËRONAUTICS.

AËROPHAGIA, ā'ēr-ō-fā'jī-ā, AIR SWALLOWING. A habit associated with gastric affections of the neurotic type, with lack of tonicity of the stomach walls. It is a common symptom of hysteria. No specific treatment is required apart from that of the disorder with which it is associated.

A'ËROPLANE. See AËRONAUTICS.

A'ËROSTAT'IC PRESS. A machine used for extracting the coloring matter from dye-woods and other materials. A vessel is divided by a horizontal partition pierced with small holes. Upon this the substance containing the color is laid, and a cover, also perforated, is placed upon it. The extracting liquid is then poured on the top, and the air being drawn from the under part of the vessel by an air pump, the liquid is forced through the substance by the pressure of the atmosphere. This instrument was used in place of the modern hydraulic press.

A'ËROSTAT'ICS (Gk. ἀήρ, aēr, air + στατός, statos, standing). That branch of science which treats of the weight, pressure, and equilibrium of air and other gases and of the equilibrium

of solids immersed in them. It is, therefore, a branch of pneumatics.

AËROTHERAPEUTICS, ā'ēr-ō-thēr'ā-pū'tiks. A system of treating diseases by subjecting the patient to varying degrees of atmospheric pressure, sometimes also by changing the composition of the air. Pulmonary tuberculosis is the disease most usually treated by this method. The air inhaled may be filtered, cooled, warmed, moistened, or dried, or impregnated with vaporized medicinal substances. The characteristics of different climates may thus be imitated very closely. Pneumatic cabinets of various types are employed, all being so constructed that the air within them can be condensed or rarefied to the desired degree. The *absolute* method is carried out by means of a chamber resembling the diving bell, in which the patient remains for a considerable time under pressure gradually increasing up to 1½ or 2 atmospheres, which is then gradually lowered. The *differential* method, that in most common use, is carried out by means of two separate kinds of apparatus. In the gasometer type the patient remains under ordinary atmospheric pressure and inhales or exhales, or both, into cylinders containing either condensed or rarefied air. In the cabinet type of apparatus the patient is surrounded by either condensed or rarefied air, while he breathes into ordinary air. Thus, it will be seen, a considerable number of combinations may be made. For example, the patient, surrounded by condensed air, may breathe into the unaltered atmosphere, or into condensed air, or into rarefied air; or, being in rarefied air, he may exhale into rarefied, condensed, or unaltered air, etc. Certain definite and constant phenomena are observed in each of these combinations. It is found that the inhalation of condensed air slows and deepens respiration, giving better ventilation to the lungs and increased vital capacity. The heart beats more slowly and powerfully, and the pulse is fuller. With the increased absorption of oxygen there is correspondingly increased metabolic activity. Exhalation into rarefied air facilitates expiration by making chest contraction easier. The heart is more thoroughly emptied of blood, and pulmonary congestion relieved. Thus, by a combination of inhalation of condensed air and exhalation into rarefied air, the benefits of climate and exercise are attained. The lungs are used to their full capacity, the appetite is increased, nutrition improved, and sleep promoted. It is to be noted, however, that this form of treatment is not safe when active inflammation of the lungs is present. Patients must be selected with great care and judgment. The beneficial effects of fresh, moving air in treating many diseases is now well recognized and appreciated. The various phases of the subject are more fully noticed under CLIMATE; TUBERCULOSIS; PNEUMONIA; ETC. (qq.v.).

A'ËROTROPISM (Gk. ἀήρ, aēr, air + τροπή, tropē, a turn, turning). The sensitiveness of certain plant organs which enables them to orient themselves with reference to the movements of gases—usually oxygen—dissolved in the medium in which they are grown. Aërotropism is a special case of chemotropism (q.v.). The pollen tubes of many plants are negatively aërotropic: when grown in sugar solution, they grow away from the surface of the medium which is in contact with air and from which oxygen molecules are diffusing. Various roots are also positively aërotropic in nature, though it is

doubtful whether aërotropism has a great part to play in the distribution of roots in the soil.

ÆSCHINES, ës'ki-nēz (Gk. *Ἀσχινης*, *Aischinēs*) (389–314 B.C.). An Athenian orator, second only to his great rival, Demosthenes (q.v.). He was born at Athens in humble station, served as a soldier, then became a clerk to some of the lower magistrates, and for a time was an actor in smaller parts. Finally, he became secretary to two distinguished statesmen, Aristophon and Eubulus, through whose influence he twice obtained election to a government secretary's office as clerk of the Ecclesia (popular assembly). Then, through his eloquence, grace, and legal knowledge, he rapidly became one of the leading men in the State. Sent as a member of the embassy to Philip of Macedon in 347 B.C., he was won over to favor the Peace of Philocrates (346), and then became the leader of the peace party at Athens as against Demosthenes, who headed the party which believed that Philip was to be opposed at every point and at any cost. In 345, because of his part in the embassy, he was charged with treason by Demosthenes and Timarchus, but, with the aid of powerful friends, defended himself so successfully that Timarchus disappeared from public life. Again, in 342, Demosthenes revived the charges in his famous speech *On the False Embassy*. Again Æschines answered successfully in a speech having the same title. He continued to favor Philip actively and no doubt contributed to the spread of Macedonian supremacy. His fall was due, however, to his hatred of Demosthenes, whom Ctesiphon had proposed to reward with the public gift of a golden crown in recognition of his services to the State. Æschines thereupon charged Ctesiphon with making an illegal proposal, and at the trial in 330 attacked him in his brilliant oration, *Against Ctesiphon*, really directed against Demosthenes. He was completely defeated by Demosthenes's speech, *On the Crown*, and so failed in his suit against Ctesiphon, suffered *atimia*, or loss of civil rights, and was condemned to pay 1000 drachmas fine. He went into exile at Rhodes, where, tradition says, he opened a school of oratory. He died at Samos. Æschines's posthumous fame is due to his three extant speeches, *Against Timarchus*, *On the False Embassy*, and *Against Ctesiphon*, which, according to Photius, were called in antiquity "The Three Graces." An anecdote often repeated shows the esteem in which the third was held. On one occasion, when he was reading to his audience in Rhodes his oration against Ctesiphon, some of his auditors expressed their astonishment that he should have been defeated in spite of such a powerful display; he replied: "You would cease to be astonished if you had heard Demosthenes." The speeches are edited by Schultz (1865); Weidner (1872); and in all collections of the *Attic Orators*. Consult especially, Jebb, *Attic Orators* (London, 1876–80); Blass, *Attische Beredsamkeit* (Leipzig, 1887–98); Norden, *Die Antike Kunstprosa* (Leipzig, 1909). The 12 letters which bear his name are spurious.

ÆSCHINES (*Ἀσχινης*). An Athenian philosopher of the fifth century B.C., intimate friend of Socrates. He was for a time a seller of perfumes at Athens, but unsuccessfully. Thereafter he lived in Syracuse, at the court of Dionysius the Younger, till the latter was expelled. He returned to Athens, and, unable to

rival Plato and Aristotle, taught philosophy privately; he ranked high also as an orator and as master of a pure Attic style. He wrote *Orations*, *Epistles*, and at least three Socratic *Dialogues*. The titles of the Dialogues were *On Virtue*, *On Riches*, and *On Death*; they sought to determine whether virtue can be taught, whether riches are good, and whether death is to be feared. We have treatises bearing these names, ascribed to Æschines, but they are not his, at least in their present form. See Gomperz, *Greek Thinkers*, vol. iii, Eng. trans. (London, 1905).

ÆSCHYLUS, ës'ki-lūs (Gk. *Ἄσχυλος*, *Aischylos*) (?525–455 B.C.). The first of the three great Athenian tragic poets. He was born in Eleusis and was of noble descent, being the son of Euphorion. He fought against the Persians at Marathon (490), Salamis (480), and Plataea (479); his epitaph celebrated his bravery on the field. He early turned to tragic composition and, according to tradition, appeared first in 497 as a rival of the older tragedians, Pratinas and Chœrilus. His first victory, however, was not won until 484. We hear also that he wrote in unsuccessful competition with Simonides an elegy over those who fell at Marathon. He undertook, apparently, three journeys to Syracuse; one about 476–475, when he composed a play, *The Ætneans*, 'The Women of Ætna,' for King Hiero (q.v.), in honor of the new city, Ætna, just founded by Hiero on the site of ancient Catana. He was back in Athens apparently in 472, but seems to have been again in Sicily between 471 and 469, when he had his play, *The Persians*, repeated there at Hiero's request. Soon after 458 he left his native city for Sicily for the last time and died at Gela in 456–455. The story that he was killed by the fall of a tortoise from the talons of an eagle, which had mistaken the poet's bald head for a rock on which it could crack the shell of its prey, is probably only a popular tale applied to Æschylus, although it may owe its origin to a misinterpretation of a scene on his monument. The citizens of Gela erected a splendid tomb to him; by a decree of the Athenians a chorus was granted for his plays alone after his death, and, about 330 B.C., at the proposal of the orator Lycurgus, a bronze statue of him, as of Sophocles and Euripides, was erected in the theatre at Athens.

The productiveness of Æschylus lasted for more than 40 years, during which he is said to have written 90 plays, of which 20 were satyr dramas. These tragedies were produced in groups of three, "trilogies," bound by a connecting thread of motive or interest, and each trilogy was followed by a satyric drama, of which genre Euripides's *Cyclops* is the only extant representative. (See SATYR.) We know 79 titles in all, among them 13 satyric plays. Only 7 tragedies are extant, *The Suppliants*, *The Persians*, *The Seven against Thebes*, *Prometheus Bound*, and the trilogy, known as the *Oresteia*, *Agamemnon*, *Choëphori*, and *Eumenides*. Æschylus won 13 victories during his lifetime; that is, he was successful with over half the trilogies he presented.

The Suppliants, or *The Suppliant Women*, is, in form, the earliest of the extant tragedies; the date of its presentation is unknown. The chorus is still the principal feature, the choral parts standing to the dialogue in the approximate relation of 1:2. The name is taken from the chorus, which is composed of the 50 daughters of Danaüs (q.v.), who have fled from Egypt

to Argos in their attempt to escape their suitors, the sons of their uncle Ægyptus, and there beg for protection from the Argive King. The odes set forth the violence of the sons of Ægyptus, the unholy character of the union which they wish, and the maidens' fears. The actors only interrupt these odes and carry the action forward but slightly in our modern sense. Yet the play has dignity, adequately expresses noble sentiments, and contains choral songs of great beauty. It was apparently the first play of the trilogy; the other tragedies were *The Egyptians*, which had for its theme the marriage of the sons of Ægyptus (q.v.), and *The Danaids* (see DANAÛS), in which the murder of the bridegrooms was accomplished, and Hypermnestra was brought to judgment for disobeying her father in sparing her husband.

The Persians was presented in 472 and is also very simple in its structure. It has great interest for us, since it is the earliest extant attempt of the Greeks to treat in the drama contemporary history. The subject is the battle of Salamis, in which Æschylus took part. The scene is laid, however, at the Persian court, where the dowager Queen, Atossa, is awaiting the return of Xerxes. The chorus consists of Persian elders, who give their name to the play. The story of the Persians' defeat is dramatically told by a messenger; then, at the advice of the chorus, Atossa summons the shade of Darius, in the hope that his wisdom can save the State; but he can only prophesy the defeat at Plataea. The appearance of the defeated Xerxes and an ode of sorrow for him and his subjects close the play. This was the second play of a trilogy; the first was *Phineus*, the third *Glaucus*, but the plots of both are unknown to us. This trilogy won the first prize.

The Seven against Thebes handled a favorite subject drawn from the cycle of Theban myths. It was the third of a trilogy, the first two being *Laius* and *Œdipus*; the satyric play was *The Sphinx*. This trilogy was presented in 467 and also won the first prize. The extant play represents the conflict between Eteocles and Polynices for the throne. Œdipus, ill-treated by his sons after he had blinded himself, prayed that they might divide the kingdom with the sword. To defeat the purpose of that prayer, the brothers agreed to reign alternate years; but Eteocles, the elder, once upon the throne, refused to surrender control at the expiration of the first year. Polynices, having raised a large army at Argos, where he had married the daughter of King Adrastus (q.v.), came to besiege Thebes; he and six other chieftains arrayed themselves each before one of the seven gates. A messenger relates to Eteocles the preparations of the seven and their oath to die rather than leave Thebes and then describes the appearance of each chief; when Polynices is reached, Eteocles can no longer control himself and rushes forth to slay his brother and be slain himself. See ETEOCLES AND POLYNICES; LAIUS; ŒDIPUS.

The Prometheus Bound, produced about 470 B.C., was the first of a trilogy, of which the *Prometheus Loosed* and probably *Prometheus the Fire-Carrier* were the other plays. In punishment for his rebellion in stealing fire from heaven for mortals' use, Prometheus (q.v.) is chained to a crag on the confines of the world, where a vulture sent by Zeus is to feed continually on his liver. He declines the proffered assistance of Oceanus, boasts of his services to

men, condoles with Io, who comes to him in her mad wanderings, and prophesies her future, and, finally, when visited by Hermes, the messenger of Zeus, bids defiance to him and amid whirlwind and earthquake disappears from view. In the following play Hercules shot the vulture and released Prometheus, and in the third the story of Prometheus was probably brought into relation with a local Attic cult of the hero.

The remaining three plays, *Agamemnon*, *Choëphori*, and *Eumenides*, formed the *Oresteia* trilogy. In the first play Agamemnon returns from Troy to his home, where his unfaithful wife, Clytemnestra (q.v.), is living with her paramour, Ægisthus (q.v.), by whom Agamemnon is treacherously murdered. This tragedy is not only the greatest of Æschylus' extant works, but rivals, in the minds of critics, even Sophocles' *King Œdipus* for the first place among all Greek tragedies. The *Choëphori* ('The Libation Pourers') is named from the chorus of women who offer libations at Agamemnon's tomb. In this play Agamemnon's son Orestes returns to Argos to avenge his father's murder and under a disguise obtains entrance to the palace, where he slays his mother and Ægisthus. This impious act of matricide was punished by the Furies. In the *Eumenides* Orestes is pursued by these avenging powers until he is cleansed from his blood guilt and set free through the aid of Athene, by the ancient court of the Areopagus (q.v.). This trilogy represents the maturest work of Æschylus, and we may well doubt whether a greater literary masterpiece was ever written.

The best critical edition of the text is by Wecklein (1885). There is an edition with English notes by Paley (4th ed., 1879), and many annotated editions of single plays; among these may be named Verrall's *Septem* (1887), *Agamemnon* (1904), *Choëphori* (1893), *Tucker's Suppliants* (1889), and *Choëphori* (1901). For complete translations consult Potter, Blackie, and Plumptre; for translations of separate plays, Browning, *Agamemnon* (London, 1887), Fitzgerald, *Agamemnon* (London, 1876), E. B. Browning, *Prometheus* (4th ed., London, 1856), and Warr, *Oresteia* (1900).

ÆSCULA'PIUS (Lat. form of the Gk. Ἄσκληπιός, *Asklēpios*). Among the Greeks and the Romans, a god of healing. No fully satisfactory derivation of the name has been presented. Æsculapius' worship seems to have originated in the valley of the Peneus in Thessaly and to have had an important centre at Tricca. From this region it was probably carried by the inhabitants, as they were forced southward by invading tribes, and thus appears in Phocis, Bœotia, and Peloponnesus, where were celebrated sanctuaries of Æsculapius at Titane and Thelpusa, in Eleusis (q.v.) in Attica, Pergamum (q.v.) in Asia, Cyrene in Africa, and, above all, at Epidaurus in Argolis, whence the worship of this god was introduced into Athens in 420 B.C. At Athens the worship spread rapidly because Æsculapius was taken under the protection of Dionysus. Colonists carried the cult of Æsculapius far and wide; at Cos, Cnidos, and Pergamum were famous temples. In consequence of a plague the god was brought to Rome in 293 B.C. and his temple established on the island in the Tiber. Æsculapius had temples in nearly 200 places. His sanctuaries were sought by the sick, and his priests undertook the cure of disease. The patient, after certain religious ceremonies, slept in a hall near the temple (the

sleep was often induced by narcotics), and during the night the god was believed to manifest himself in a vision, which, when interpreted by the priests, furnished directions for the treatment. After the cure the patient left an account of his case and an offering for the god—often a representation of the part of the body cured, eyes, hands, or feet, with liberal fees. (See Aristophanes, *Plutus*, 653 ff.) Records of cures at Epidaurus and at the shrine in Rome have come down in great numbers. It seems likely that the priests had acquired considerable medical knowledge and skill in treating the sick and that the sacred sleep was merely a device to preserve the credit of the god. Greek medicine was thus intimately connected with the worship of Æsculapius.

It should be said that in the *Iliad* Æsculapius is not spoken of as a god, and his sons Machaon and Podalirius differ from the other heroes only in their superior skill in treating wounds. It seems evident, however, that he was originally a divinity who later became subordinate to the great Apollo cult. Much points to Æsculapius as a chthonic god, though many regard him as connected with the light. Whatever his nature, Æsculapius early became fixed as a god of healing, perhaps losing his other functions through association with Apollo. His sons Machaon and Podalirius play a considerable rôle in heroic legend and were claimed as ancestors by the Asclepiadæ (q.v.). His daughters, Hygeia (health), Panacea (all-healing), Iaso, Aigle, and others, bear names that show them to be merely personifications of abstract ideas connected with healing.

The myths connected with the life of Æsculapius varied in different localities; but the one which has become canonical appeared in a lost Hesiodic poem (the *Eoœœ*: see HESIOD), and is known to us from a poem by Pindar and some scattered allusions in other writers. Apollo loved Coronis, daughter of Phlegyas, but she proved faithless and wedded the Lapith, Ischys. The news was brought to Apollo by the raven; the bird was punished for its message by being changed from white to black. Apollo slew Ischys, and Artemis killed Coronis; but, while Coronis' body was on the funeral pile, Apollo rescued his yet unborn son Æsculapius, and took him to the centaur Chiron, who trained him in the healing art, in which he became so expert that he even raised the dead. For this presumption Zeus slew him with his thunderbolt. In art, Æsculapius is usually represented as a bearded man, wearing a mantle which leaves the right shoulder and the breast bare; a snake usually attends the god. A beautiful head from Melos in the British Museum is probably an Æsculapius of the Praxitelean school. Consult: Walton, *The Cult of Asklepios* (New York, 1894); Wilamowitz-Möllendorff, *Isyllos von Epidaurus* (Berlin, 1886); Farnell, *Cults of the Greek States* (Oxford, 1896-1907).

ÆSCULUS. See HORSE CHESTNUT.

ÆSIR, ē'sir or ä'sir (pl. of As, Icel. *áss*, god, demi-god). The gods of the Northmen of Scandinavia and Iceland. There were 11 chief gods or Æsir besides Odin (the 'all-father'), viz., Thor, Balder, Ty or Tyr, Bragi, Heimdal, Höd, Vidar, Vali, Ull, Forseti, and Loki or Lopt. To these may be added Njörd and his son Frey, who were not originally Æsir. The naming of the gods differs in different parts of the *Younger Edda* (see EDDA). The chief goddesses

of Asgard, the Scandinavian Olympus, were Frigga, Freyja, Nanna, Sif, Saga, Hel, Gefjon, Eir, Hlin, Lofn, Vör, and Snotra. These names, considered in the primary old Norse signification of the words, in most instances allude to some characteristics; yet it is impossible to determine whether they personify merely certain physical powers of nature or were originally the names of individuals in the prehistoric period. Probably they have a mixed origin and combine real names with physical powers. The principal source of information concerning these gods is the *Eddas* (q.v.), collections of the oldest songs and traditions of the people of Scandinavia.

Thor, son of Odin and Frigga ('the vivifying'), is the chief god next after Odin and is the strongest of the Æsir. He seems to have been a god of that Phœnician form of nature worship which was superseded in Scandinavia and northern Germany by the faith of Odin. From Thor's hammer flashed lightning, and his chariot wheels made thunder as he went through the air, cleaving mountains, loosening frozen streams and pent-up rivers, and slaying giants and monsters. He was seldom in Asgard with the other Æsir, but dwelt in his mansion Bilskirner, in the densest gloom of the clouds. With his hammer he consecrated the newly wedded, and the sign of the hammer was made by Northmen when they took an oath or any serious obligation. Thor was the god of thunder, the destroyer of evil spirits, the friend of mankind, and the defender of the earth, the heavens, and the gods against the giants. The early Christian missionaries in Scandinavia, finding the faith in Thor too strong to be suddenly uprooted, tried to transfer many of his characteristics to their zealous convert, St. Olaf, who was said to have resembled the old Norse god in his comeliness of person, his bright red beard, hot temper, and personal strength; while some of the monks of a later period tried to persuade the Northmen that in Thor their forefathers had worshiped Christ and that his mallet was a rude image of the cross. Slaves and thralls killed in battle were believed to be under the protection of Thor, who, as the god of the Finns before the spread of the As religion, was honored as their special guardian against the tyranny of their old masters.

In Balder, the son of Odin and Frigga, the Norsemen honored the beautiful, the eloquent, the wise, and the good, and he was the spirit of activity, joy, and light. His name signifies the 'strong in mind.' His wife Nanna reflected these attributes in a less degree. On his life depended the activity and happiness of all the Æsir except Loki, the 'earthly fire' or incarnation of evil; and hence Loki, from envy of the beauty and innocence of Balder, accomplished his death and afterward hindered his release from the power of Hel, the goddess of death. As the death of Balder was to be followed by the fall of all the Æsir, the gods had caused all things to swear not to injure him. But the insignificant mistletoe was overlooked or thought unimportant. Loki secured an arrow of mistletoe, and when the gods were amusing themselves by shooting at the invulnerable Balder, Loki gave his arrow to Höd, the blind god, and directed his aim so as to hit Balder, who was killed. The death of this beneficent god, for he was the symbol of the summer sunlight, signifies the fading of summer before the blind and fierce winter, her preordained destroyer. The myth

continues: After Balder's death the gods captured Loki and shut him up in a mountain, where he will remain until the earth and all therein and the gods themselves shall be destroyed by fire (the powers of evil). The companion and liberator of Loki, Odin, alone will survive, and then a new and purer world will arise in which Balder will again appear, and Loki, or evil, be no more heard of.

At first Loki, under the name of Lodhur, or 'flame,' and as the foster brother of Odin, had united with the all-father in imparting blessings to the universe. Afterward he left the council of the gods and wandered into space, desolating and consuming with flame all things that came in his way. In the under-earth, where volcanic fires attest his presence, he consorted with evil giantesses and became the father of Hel, 'pallid death,' of Angerboda, 'announcer of sorrow,' of the wolf Fenrir, and of the Midgard serpent, who ever threatens the destruction of the world. Loki assumes any shape at will. As sensuality he courses through the veins of men, and as heat and fire pervades nature and causes destruction. After the establishment of Christianity the attributes of Loki were transferred to Satan; but in Iceland an *ignis fatuus* is still known as "Loki's burning."

Njörd and his children, Frey or Fricco and Freyja, appear to have been honored in the North before the time of Odin. Njörd is said to have lived in Vanaheim, and to have ruled over the Vanir, or elves of light, long before he became one of the Æsir. He is the god of oceans and controller of winds and waves, and to him seafarers and fishermen raise altars and make prayers. Frey, his son, is the god of rain and fruitfulness, and his worship was accompanied with phallic rites. His sister Freyja, who holds a high rank among the Æsir, is the goddess of love, but her influence, unlike her brother's, is not always beneficent and varies with the form she assumes in operating on the minds of men. Her chariot is drawn by cats, who are emblems of fondness and passion; and a hog, implying fructification or sensual enjoyment, attends upon Frey and herself. The Swedes paid especial honor to Frey, while the Norwegians worshiped Thor.

Ty (Tyr), the Mars of the Norsemen, is wise and brave, giving victory, and fomenting strife. He is also a son of Odin, and is the most daring and intrepid of all the gods. His name lives in our Tuesday (Ty's day), as does the name of Odin in Wednesday (Woden's day), Thor in Thursday (Thor's day), and Freyja in Friday (Freyja's day). Tyr's name signifies 'honor,' and his worship was widely spread in the North. Bragi, the son of Odin, was the god of eloquence and wise sayings, the originator of the Skaldic poems; and when men drank Bragi's cup they vowed to perform some great deed worthy of a skald's song. Bragi's wife was Idun, who guarded the casket of apples that gave to those who ate them perpetual youth. She was abducted by the giant Thiassi, and by Loki's craft removed to the other world. Her release in spring seems analogous to the myth of Proserpine. Heimdal, personified by the rainbow, is the god of watchfulness, the doorkeeper of the Æsir. Vidar, the strongest of the gods except Thor, is the personification of silence and caution. He is the brother of the gods, being the son of Odin. Vali is the brother of Balder and a great marksman. Ull decides issues in single

combat; Forseti settles all quarrels; lovers find protection in the goddesses Lofn and Vör, of whom the former unites the faithful and the latter punishes the faithless; Gefjon keeps a watch over maidens and knows the decrees of fate; Hlin guards those whom Frigga, the Queen and mother of heaven, desires to free from peril. The Queen herself, as Odin's wife and mother of the Æsir, knows but does not reveal the destinies of men. Saga is the goddess of narration and history; her home is in Sökvabek, the abyss, an allusion to the abundant streams of narrative, from which streams Odin and Saga daily drink and pledge each other. Snotra is the goddess of sagacity and elegance, from whom men and women seek good sense and refined manners. The Norns, the weird sisters, and the Valkyrias are closely connected with the gods. The principal Norns are Urd, past time; Verdandi, present time, and Skuld, future time. They twist and spin the threads of destiny and make known what has been decreed from the beginning of time. They preside at the birth of every man and cast the weird of his life. The Valkyrias, a troop of goddesses, of whom there are over a dozen, are sent by Odin to the battle-fields to choose the slain.

It remains to add that in the gods here mentioned the Northmen recognized the makers and rulers of the world that now is, from whom emanated the thought and the life that pervade and animate nature. With Odin and Æsir the intellectual life of the northern people began; and although they ascribed to them human forms and acts, these were seldom without something higher and nobler than pertains to mortals; and while they recognized the existence of a state of chaos and darkness before the world began, they anticipated the advent of another state in which the gods, like men, would receive their reward at the hands of a supreme All-father. Consult Anderson, *Norse Mythology* (Chicago, 1901). See the article on SCANDINAVIAN AND TEUTONIC MYTHOLOGY, and the separate articles on the gods, such as FREY; LOKI; ODIN, ETC.

Æ'SOP (Gk. Αἴσωπος, Aisōpos). The name of a famous Greek writer of fables, who is said to have been born a slave in Samos late in the seventh century B.C., but to have gained his freedom by his cleverness. We may, however, well doubt whether he ever existed; we have the most varied accounts of him, many of which on their face are pure inventions; and the fables which passed under his name were certainly not written until long after the period in which he is supposed to have lived. Socrates in prison turned some of the current Æsopic fables into elegiac verse; and about 320 B.C. Demetrius of Phalerum made a prose collection of the fables known to his day. Whatever the facts as to Æsop's existence, it is certain that his soon became a generic name attached to those beast fables which are part of the common property of the Indo-European peoples. The collection which now bears his name consists for the most part of prose paraphrases of the collection of fables made, in choliambic verse, by Babrius (q.v.), edited by Halm (2d ed., 1860). Consult Jacobs, *Introduction to the Fables of Æsop* (New York, 1896); Keidel, "The Editio Princeps of the Greek Æsop," in *American Journal of Philology*, xxiv, 304-317 (1903). See PHÆDRUS.

ÆSOPUS, è-sō'pūs, CLODIUS, or **ÆSOP**. A great Roman tragedian, contemporary with Quintus Roscius (q.v.), the comedian. Cicero put himself under the direction of these two to perfect his own elocution, and Æsop did many friendly services to Cicero during the latter's banishment. Æsop was noted for sinking his own personality in the character he represented; grave and sedate, he acted best the less vehement tragic rôles. He made his last appearance in 55 B.C. at the dedication of Pompey's theatre, after which his voice failed him. He left a fortune to a worthless son—the Æsop who, according to a well-known story, dissolved in vinegar a pearl valued at \$40,000, to have the satisfaction of swallowing the most expensive drink ever known.

ÆSTHESIOMETER, ès-thē'sī-ōm'è-tēr or ès-thē'zhī-. See PSYCHOLOGICAL APPARATUS.

ÆSTHETICS, ès-thèt'iks (Gk. τὰ αἰσθητικά, *ta aisthētika*, or ἡ αἰσθητική, *hē aisthētikē*, the science of the beautiful, from αἰσθητικός, *aisthētikos*, perceptive, sensitive, αἰσθάνεσθαι, *aisthanesthai*, to perceive, apprehend by the senses). The name now generally given to the science of the beautiful, the sublime, and the ludicrous. The history of this science furnishes us with a striking illustration of the truth that theory always follows practice. It was not till the noblest period of art in Greece had passed its zenith that any serious attempt was made to ascertain the nature of the beauty which art presents. The Sophists and Democritus seem to have made some essays in this direction, but we know practically nothing of the results they reached. It is only when we come to Socrates that we are on secure historical ground; and even in his case we know only enough to make it possible to begin our sketch of the history of æsthetics with his name. He seems to have taught that beauty is one with utility—a doctrine which is thoroughly in keeping with his ethical utilitarianism, but which gives no distinctive recognition to the beautiful as in any way differentiated from the good. Plato, in one respect, follows in his master's steps. While we cannot say that he identified the æsthetic and the ethical, yet in his most serious discussions he so completely subordinated the former to the latter as to make it a mere handmaid of morality. This attitude is unintelligible to any one who does not remember that Plato lived in an age of decadence in art and in art appreciation. The great poets in the Hellenic world were not in his time appreciated so much for their beauty as revered for their infallibility as guides in faith and practice. A quotation from Homer would definitely settle a question in policy or morals, and a "Thus saith Simonides" was a *ne plus ultra* of debate. This dogmatism in the interpretation of poetry was responsible for the degradation of the poets from their places as artists charming and inspiring mankind to the position of pedantic pedagogues, whose deliverances were open to question on the ground of fact by any one who had the temerity to deny their popularly conceded inerrancy. Such a one was Plato, who proceeded to meet this dogmatization of poetry by a demand for its moralization. Homer, he claimed, must be expurgated in the interests of a more worthy view of God and man. Other arts suffered a like fate. For instance, only such music as could directly fit a man the better for a life of courage and temperance was to be tolerated in the ideal

Platonic State. But this insistence upon the right to judge art by moral standards alone, though very prominent on the surface of Plato's thought, does not represent his best philosophy of the beautiful. Remembering that music was for Plato a general term for all the human interests over which the Muses presided, and that training in music was for him a cultivation of a proper habitual attitude toward the good, and that a scientific education in moral values was to follow the musical education and so bring habitual attitude to insight, one might almost say that with Plato the beautiful is the form in which the good appears to a properly trained but unreflective consciousness, a view quite like that of Hegel, 2200 years later. And as the good is the supreme principle of unity in the universe, beauty is itself a relatively simple unity in variety. This variety, however, must not be too complicated. It must have a very narrow range, or it would break over the bounds of unity. Hence only those works of art which are severe in their classical simplicity were considered as true embodiments of the principle or "idea" of beauty. Such an embodiment was technically called an "imitation." This term, without doubt, meant more for Plato than it would naturally mean for us. Imitation was symbolization as well as copy. But, for the most part, Plato was unable to free himself from the conception that second-hand reproduction was characteristic of all art. Hence art is further from reality than nature, which is the first embodiment of reality. But no definite statement of Plato's æsthetic views would do justice to the unsystematic many-sidedness of his thought on the subject. His dialogues contain many stimulating suggestions as to the nature of beauty, but no explicit æsthetic theory, built on the basis of these suggestions, could be fairly attributed to Plato.

Aristotle, being himself less artistic than Plato, was in a better position to make a more scientific study of æsthetics. His works on rhetoric and poetics, and, in a more desultory way, many of his other writings, were the first inductive studies we know of the principles of art. He differentiates the good from the beautiful: the good is dynamic (*ἐν πράξει, en praxei*), the beautiful may be static (*ἐν ἀκινήτοις, en akinētois*). The good, being thus always connected with action, appeals to consciousness in the form of desire for possession. We are interestedly concerned in the good; our concern in the beautiful is disinterested. For Aristotle, as for Plato, a beautiful object is a unity in variety, but Aristotle gives a wider scope to the variety than his predecessor. Under the proviso that a thing be not too large for easy apprehension, a considerable multiplicity in its organization was regarded as conducive to beauty, and, other things being equal, the greater the size the greater the beauty. Among these other things were propriety in the arrangement of parts, symmetry, and clearness of outline. Aristotle followed Plato also in making art an imitation of inartificial beauty, but he refused to follow Plato when the latter depreciated art for this reason. While Plato put the fine arts far below the works of the artisan, Aristotle put poetry, in one passage, above theoretic philosophy. This position, however, does not accord with the rank given in his *Ethics* to the life of philosophic contemplation. The value Aristotle attributed to art, especially to the drama, was

due to the fact that it "effects, by means of pity and fear, the purgation (*κάθαρσις*, *katharsis*) of such emotions." The meaning of this has been warmly debated. If purgation is taken in a moral sense, then Aristotle has relapsed into the Socratic position that art is not differentiated from morality. But a more plausible interpretation is that purgation is used in its physiological significance. This would make the meaning to be that drama gives free and healthy discharge to the passions of pity and fear and thus prevents emotional congestion. Greek speculation on æsthetic theory comes to a close in Plotinus (q.v.), who explains beauty by referring it to the work of an objective reason, which gives a form to dead matter so as to make it become an expression of itself. This creative reason is the transcendently beautiful; matter transformed by it is the empirically beautiful. Artistic production is not, however, necessarily limited to the copying of the natural products of the supreme reason. The human reason, by virtue of its participation in the divine, may so transform objects that they shall become more beautiful than they are in their naturalness. Art is thus raised from the stage of imitation to that of idealization, although idealization is taken mystically.

No important æsthetic speculations come from mediæval writers. Mr. Bosanquet, in his *History of Æsthetic*, has satisfactorily explained this comparative barrenness of the Middle Ages in æsthetic theory. It was not due, as the traditional view of mediævalism would seem to imply, to the deadness of that period in things intellectual and spiritual, but to the enormous tension of the higher life, which busied itself so absorbingly in practical creative activity as to leave no leisure for reflection upon its own work. Mediævalism was engaged in the problem of building the foundations for a new life and, therefore, for a new art. The art of classical antiquity was comparatively simple; the perfection of its form was made possible so early by its limited ambition. In general, it sought to do justice merely to the beauty of form. It was a successful criticism of life, only because it criticised one aspect of life, leaving the richness and variety of its contents to the one side. But Romanticism as a creative principle in art began to work early in the Middle Ages. The wilder, more turbulent spirit of the Teutonic barbarians would not brook confinement within the narrow lines drawn by classic masters, and for a whole millennium was wrestling with the practical problem of making art richer by the incorporation within it of all the phases of nature and of human life, which classic art, with true instinct for its own essential limitations, had ignored; and just as ancient æsthetic theory was not constructed until the returns from ancient practice were all in, so modern æsthetic theory could not be supplied with its data till modern art had become to a great extent a completed achievement, challenging reflection to concern itself with the discovery of the principles involved. Mr. Bosanquet is, perhaps, right in representing Shakespeare as being the last of the great artists in the long succession that began with the architect of St. Sophia; Shakespeare succeeded in the great common endeavor to render into art life and nature in all their infinite complexity, and yet to make the rendition as unitary in its effect as were the art products of the golden age of Æs-

chylus and Pheidias. In him the wheel of artistic creation had come full circle, and after him, therefore, the wheel of æsthetic theory could begin to turn. But there was another reason why, after the time of Shakespeare, æsthetic theory should have become a great need. Not only did all the richness of mediæval and modern artistic achievement challenge the theorist to study it, but the art of classical times had come to life again in the great archæological discoveries of the eighteenth century. The literary renaissance of antiquity in the fifteenth century was now followed by the resurrection of the plastic arts of Greece and Rome. The striking contrast between the formal severity of the antique and the freedom of the modern demanded that an inquiry should be instituted which should succeed in correlating, and, by correlating, succeed in justifying, the two strikingly different types. This demand that theory should do injustice to the principles of beauty incorporated in art was reinforced from the side of philosophical speculation.

The seventeenth and eighteenth centuries were a time of tremendous philosophical energy; and as the idealism of modern philosophy became more and more concrete, it was inevitable that æsthetic questions should force themselves more and more upon the attention of philosophy. Thus, as we find Lessing and Winckelmann representing predominantly an interest in art for art's sake, so we find Baumgarten and Kant representing an interest in art for philosophy's sake. These two tendencies united in working out a modern æsthetic theory, which was finally to be based on solid scientific grounds with the aid of experimental psychology. The appreciation of the æsthetic significance of all these contributions cannot be attempted here. Suffice it to say that Lessing made an important addition to æsthetic theory by marking off the boundaries of poetry from the plastic arts. The medium of the former is time, and that of the latter is space. The former can represent action and is, therefore, capable of expressiveness, whereas the plastic arts are limited to the treatment of formal beauty and of the beauty of colors. The ugly is out of place in the plastic arts, because, once represented in painting or statuary, it gets a permanence that becomes revolting. This thought might be illustrated by referring to a line of Keats's *Ode on a Grecian Urn*, "Forever wilt thou love and she be fair." There is a subtle but powerful delight ministered by this insistence upon the immortality of youth and love, caught and made perpetual by the ceramic art. But change the *motif*; let it be: "Forever wilt thou loathe and she be foul," how quickly the thought of the abidingness of the unpleasant creates disgust with the pottery, however skillful may be the representation of this phase of life! Baumgarten's significance was more that of a pioneer and name-giver than that of an important contributor. Carrying out the Cartesian idea that sense is confused thought, he added to the Wolffian (see WOLFF) philosophical encyclopædia, which included ontology, cosmology, ethics, and psychology—all sciences of clear thought—a new discipline dealing with obscure thought; and he gave to the work in which he treats this new subject the title *Æsthetica*. This was the first time that the term was employed to designate the science which has since Baumgarten's day quite constantly been called by this name. But great as

is the convenience of having a name to give to a science, an advance in the way of a satisfactory handling of this science could hardly be expected from a thinker who appreciated beauty only as an imperfect imaging of what is intellectual.

Kant (q.v.) has been an important factor in determining the speculations of modern philosophical æsthetics, although what he calls æsthetics in his famous *Critique of Pure Reason* is something entirely different from what to-day passes under that name. He strikes, in his *Critique of the Faculty of Judgment*, a distinctly modern note in emphasizing the affective or emotional side of æsthetic appreciations, thus exalting the artistic consciousness from the position of being an imperfectly developed logic and metaphysics. But Kant's views are too completely determined by the idiosyncrasies of his philosophy ever to have become generally acceptable. His philosophy is dominated by the thought of a great breach between noumena and phenomena. (See APPEARANCE.) The datum of philosophy is this apparent breach, but the problem is in large measure the healing of it. But this Kant could never succeed in effecting. In his first two *Critiques*—those of Pure Reason and of Practical Reason—he deals with phenomena and noumena in their antithesis and separation. In his *Critique of the Faculty of Judgment* (1790) he attempts to bring about a connection and synthesis. In his definition of beauty he follows his division of categories into those of quality, quantity, relation, and modality. Qualitatively, the beautiful is the disinterestedly pleasing; quantitatively, it is the universally pleasing; relationally, it is that which has the form of purposiveness without the reality of purpose, and, modally, it is the necessarily pleasing. Thus, disinterested, universal, and necessary pleasure in simulated design is for Kant the essence of beauty. The sublime is that which pleases because of a reaction, after an inhibition of vitality—a reaction which gives rise to a higher degree of vitality. The ridiculous is also a reaction against tension, being “the sudden change of a tense expectation into nothingness.” As in the case of Kant, so in those of Schelling (q.v.) and Hegel (q.v.), the philosophy of the beautiful has its part assigned to it in accordance with a comprehensive view of the universe. Schelling's absolute was one of utter indifference of subject and object. Therefore, in artistic appreciation it is this ultimate unity of absolute indifference which is perceived as the beautiful. In Hegel the absolute is not the indifferent, but the differentiated unity of subject and object, and art is a form of the absolute consciousness, i.e., it is such an attitude of consciousness toward its objects as does not eject them into an existence independent of itself; yet it does not fail to observe the distinction between consciousness and objects. There are three forms of absolute consciousness, of which art is the first. In the art-consciousness the unity of subject and object is relatively simple. Although subject and object are not reflectively identified, they are not held apart, as in scientific knowledge. The beautiful is thus the absolute idea immediately perceived. Hegel's followers, Rosenkranz, Schasler, and Vischer, worked along these lines and elaborated a very detailed æsthetics. Schiller (q.v.) returns to Kant and differentiates the material and the formal impulses which, working in conjunction, produce the beautiful.

In England Shaftesbury (q.v.) worked in a Platonic spirit, and Hutcheson (q.v.) makes “all beauty relative to some mind perceiving it.” The mind has a faculty, “an internal sense,” which is capable of receiving ideas of beauty from all objects in which there is uniformity in variety. Reid (q.v.), on the contrary, gives an objective value to beauty, claiming that it exists apart from our perception of it. Henry Home calls beauty the pleasure connected with sight and hearing. Hogarth (q.v.) makes a great advance in paying attention to details. He went back to the ultimate sensitiveness of the mind to certain geometrical forms and colors, and in this respect was the forerunner of recent psychological æsthetics; while Burke (q.v.) goes further and looks for the explanation of beauty in certain physiological effects produced by the beautiful object. The relaxation of nerves by appropriate stimuli has a soothing effect, which is the basis of æsthetic pleasure. Hence the beautiful must be *petite*. Alison (q.v.) is distinguished by the thoroughgoing way in which he applies Associationism to the explanation of pleasing æsthetic effects. The delight we take in a beautiful object is due to its delightful suggestions. Bain (q.v.) elaborates this Associationism and differentiates the æsthetic pleasures from others by their disinterestedness, purity, and sympathetic value, as being sharable in a way in which others are not. Spencer (q.v.) introduces Evolutionism into æsthetics and thus accounts for the æsthetic pleasures that in the individual seem to arise from congenital dispositions, by claiming that these dispositions are the survivals by heredity of associations formed in the history of the race. Consult: Gayley and Scott, *Guide to the Literature of Æsthetics* (Berkeley, Cal., 1890); W. Knight, *Philosophy of the Beautiful* (New York, 1891); B. Bosanquet, *History of Æsthetic* (London, 1892); Walter, *Geschichte der Aesthetik im Altertum* (Leipzig, 1893); Hirn, *Origins of Art* (New York, 1900); Puffer, *Psychology of Beauty* (New York, 1905); Dessoir, *Aesthetik und allgemeine Kunstwissenschaft* (Stuttgart, 1906); A. J. Balfour, *Criticism and Beauty* (Oxford, 1910); J. M. Guyau, *Les Problèmes de l'Esthétique contemporaine* (Paris, 1897); H. R. Poore, *The Conception of Art* (New York, 1913).

ÆSTHETICS, EXPERIMENTAL. Experiment made its way into the field of æsthetics from psychology on the one side and from philosophy and mathematics on the other. About the middle of the last century, while experiment was young in psychology, a dispute arose among theoretical writers concerning the æsthetic value of simple space-forms. A. Zeising, professor of philosophy in Munich, urged that formal beauty demands a simple proportionality; and while others saw, in both nature and art, a preference for equality, balance, or the relations given by the vibration ratios of consonant musical intervals, or the heptagon, or the square, Zeising carried out his theory most methodically of all. He meant by proportionality the division of an object in such a way that the smaller part, the minor, stands to the greater, the major, as the greater to the whole. This division is called the Golden Section. Zeising made the most extravagant claims for the importance of his law. He maintained that it furnished the pattern for the human body, the structure of plants, the forms of crystals, the arrangement of planetary

systems, and that it determined the proportions of buildings, sculptures, and paintings.

It occurred to G. T. Fechner (q.v.) to test the claims of Zeising and his opponents, in so far as æsthetical preference was concerned, by observing series of divided lines and of simple forms—rectangles, ellipses, and crosses—under experimental conditions. He made use of a large number of persons, asking each to state his preference within each series. Fechner also performed an important service in discriminating between the associational factors in the æsthetic judgment (those furnished by the use, purpose, rareness of objects) and the direct effect produced upon the feelings by the form or the color or the rhythm itself. It is to this latter non-associational element that experiment has directed its attention. It offers the advantages of simple and constant conditions and of a direct appeal to the undivided judgment. It has confined itself thus far to the elements which are common to all individuals. Within this limited field it may fairly be said to have been successful.

Methods and Results. The result of Fechner's work was to modify the assertions of Zeising and other theorists. A decided preference for the proportion of the Golden Section was found with certain figures, particularly the rectangle. For the simple sectioning of a line, on the other hand, preference was shown for the division into halves and thirds. Fechner is justly called the founder of experimental æsthetics. He laid out the field, distinguished the direct and the associative factors, gave the methods, and applied them successfully. There are three chief methods now used in experimental æsthetics: (1) choice, (2) construction, and (3) use. In the method of choice, series of simple figures, tones, or colors are presented to the observer, who selects the one most pleasing in its own right. The objects may be given in pairs (method of paired comparisons), or in a progressive series (serial method), or promiscuously, according to the material used. In the method of construction the individual is given elements, e.g., two narrow strips of cardboard, and is asked to make from them the most pleasing figure (cross) that he can. The method of use or application consists in collecting the dimensions of simple, common objects, as visiting or playing cards, envelopes, vases, newspapers, books, windows, façades, in order to discover the usual or most common proportions. The value of the last-named method rests on the supposition that the proportions most used are the most agreeable. This is true only in part: fitness, cost, use to which an object is put, and custom play a large part; for these reasons the method requires caution. The second method suffers from rather narrow limitations. Both it and the third, however, are of value as checks upon the method of choice, which is the most trustworthy and has been most successfully employed.

The methods named have been used chiefly with spatial forms: rectangles, crosses, lines, angles, circles, ellipses, and triangles. They have succeeded best with the simpler figures. Fechner's early results have been, for the most part, confirmed. We know now that certain divisions and dimensions are æsthetically pleasing for their own sake, that is, with no specific association attaching to them. The most agreeable are expressed by the ratio 1:1 and (approximately) 3:5, the last-named ratio standing near the relation for the Golden Section given above.

For example, the grand average from 23 series in which various forms (lines, angles, crosses, and ellipses) were used, with a number of observers, gave as the most pleasing ratio 1:1.635, with an extremely low fluctuation for the different series. We conclude, then, that the most satisfying combinations are those in which the parts are alike and those in which they are moderately similar. One is tempted to point to the mathematical relation of the Golden Section as an explanation of the æsthetic enjoyment found in proportion. But the relation is in itself no explanation, and, even if it were, the deviations from it which many individuals show would invalidate it. A recent explanation of the æsthetic feelings connected with space forms points out that man involuntarily invests spatial objects with the activities—strains, resistings, tensions—which he himself feels in his own body. According as an object—a pillar, a statue, or a block of stone—gives evidence that it is capable or incapable of holding its own, supporting its load, and maintaining its own integrity does it awaken a feeling of satisfaction or dissatisfaction in the observer. This tendency shows itself, it is argued, even where the object is reduced to a mere outline. The argument gains part of its weight from the fact that it also gives a reason for a host of illusions connected with our perception of spatial relations. A true mathematical square is not seen as a square at all, but as a rectangle whose height is greater than its breadth; a bisected vertical line looks longer above the point of division than below, and so on. The allowance made for these illusions is probably the most important advance in method since the days of Fechner. It is to be noted that the explanation, which we may call a dynamic one, brings in the associational factor. Yet this is not a fatal objection, for the associations assumed are generic, so to speak, and thus constant, within limits, for all individuals. The theory must, however, share honors with a psychophysical one, which accounts for the elementary æsthetic feelings in terms of the simplicity and complexity of psychophysical processes underlying them. It is probable, that is, that the facility with which certain proportions are cognized affects directly the excitability of the nervous system in such a way as to produce pleasure.

The method of choice may be adapted to the determination of the æsthetic value of elementary musical combinations. We obtain thus a graded series of pleasantnesses for tonal intervals both when the constituent tones are given simultaneously (see FUSION) and when they are given successively. There is afforded in this way an opportunity to compare directly the result of experimentation and the elements of musical composition established by generations of practice. It must be added that simple musical combinations offer a particularly good field for experimental exploration of the æsthetic feelings, because the direct, sensuous factor plays a much more important rôle here than in spatial form, and the associative factor is correspondingly less prominent. This is especially true of rhythm.

Finally, æsthetic preference in the realm of color, saturation, and brightness has been determined by the method of paired comparisons—the observer comparing in turn a red, then a green, then a blue, etc., with each of the other members in a series of colors, and also by passing judgment on those visual sensations taken singly

The chief results are these: (1) the most saturated colors are usually preferred; (2) given likeness of saturation, individual preferences vary from color-tone to color-tone, and (3) with colors which are equally pleasing, the combination of any two gives greater satisfaction the more unlike (contrasting) the colors.

A beginning has been made in the experimental investigation of the comic. The methods of comparison and choice, and certain modifications of psychophysical methods have been applied to comic pictures. The results show that the comic impression decreases with repetition of the stimulus, while it increases with an increase in the size of the picture. Other factors which determine the nature of the impression are: the disposition of the observer, the effect of the preceding picture, and the facial expression of the subject of the picture. It has also been found that the degree of exaggeration which produces the comic effect can be measured.

Finally, various forms of the method of expression have also been used. (See AFFECTION.) The most promising of these methods is a photographic registration of mimic and pantomimic movements. (See EXPRESSION; EXPRESSIVE MOVEMENTS.) A picture is shown; and a photograph, taken of the observer at the same time, reveals characteristic differences in bodily posture, facial expression, position of the hands, etc. The photographic method has also been employed in the study of an observer's eye movements while he is regarding graceful curves and symmetrical forms. The results seem to disprove the theory that our pleasure in such forms is due to the ease and smoothness of the eye movement. This movement is, in fact, interrupted, jerky, and unlike the outline of the figures.

Consult: G. T. Fechner, *Zur experimentalen Aesthetik* (Leipzig, 1871); *Vorschule der Aesthetik* (Leipzig, 1876); T. Lipps, *Raumästhetik und geometrisch-optische Täuschungen* (Leipzig, 1897); George Santayana, *The Sense of Beauty; Outlines of Aesthetic Theory* (New York, 1896); O. Külpe, "Der gegenwärtige Stand der experimentellen Aesthetik," in *Bericht ü. d. II Kongress f. exp. Psychol.* (Leipzig, 1907).

ÆSTIVAL, ɛs'ti-val or ɛs-ti'val, or **ESTIVAL** (Lat. *æstivus*, of summer, from *æstas*, summer). Plants whose conspicuous functions, especially the blooming of the flower, occur in summer, are said to be æstival. Prairie plants, especially of the composite family, are largely æstival and contrast strongly with the vernal plants of the woods, such as many members of the lily family.

ÆS'TIVA'TION. See FLOWER; HIBERNATION; and ESTIVATION.

ÆËTA, ä'ä-tä. The woolly-haired, dark-colored, dwarfish aborigines of the Philippines. See NEGRITO.

ÆTHEL, äth'ël. A combining form which occurs as the first element in many Anglo-Saxon names. It is derived from AS. *æfel*, noble, and is akin to Ger. *Adel*, nobility, *edel*, noble; compare Engl. *atheling* (q.v.), an Anglo-Saxon prince or nobleman, and *ethel*, noble. The names in which this combining form occurs (e.g., *Ethelbald*, 'Noble Bold,' *Ethelwulf*, 'Noble Wolf,' etc.), when given in the present work, are generally to be found under the more modern spelling *Ethel*, which is that adopted in Leslie Stephen's *Dictionary of National Biography*.

ÆTHELBALD, äth'ël-bald. See ETHELBALD.

ÆTHELFLÆD, äth'ël-fläd. See ETHELFLÆDA.

ÆTHELHARD, äth'ël-härd. See ADELARD.

ÆTHELING, äth'ël-ing. See ATHELING.

Æ'THIO'PIS (Gk. *Aithiōpis*). The name of a Greek epic in five books by Arctinus of Miletus, one of the Cyclic Poets (q.v.). It relates the events of the Trojan War immediately succeeding those described in the *Iliad*, the heroine of the poem being the Amazon queen, Penthesilea, slain by Achilles.

Æ'THRIOSCOPE (Gk. *aithria*, *aithria*, clear sky + *σκοπεῖν*, *skopein*, to observe, watch). An instrument to measure the temperature effects produced by radiation, invented by Sir John Leslie in 1817, and described in the *Transactions* of the Royal Society of Edinburgh for the following year. It consisted of a concave metallic mirror, or cup, containing a differential thermometer, and was so finely constructed as to be influenced by a passing cloud. With it Leslie hoped to discover the effect of the clouds upon atmospheric conditions and to explain other meteorological phenomena.

ÆËTION, ä-ē'shī-on, or **ËËTION**, ee'shion (Gk. *'Aetion*, *'Eetion*). A Greek painter and sculptor who flourished in the latter half of the third century B.C. He was highly praised for his technique and was classed with such painters as Nicomachus and Apelles. His most famous painting represented the wedding of Alexander and Roxana. Scarcely anything is known of his life.

ÆËTIUS, ä-ē'shī-ūs. Called "the ungodly." A Roman theologian who lived in the fourth century. He was born in Antioch and sold into slavery; when liberated, studied medicine and theology at Antioch, became a deacon, and developed the doctrines called the Aëtian heresy. This was an extreme Arianism, holding that the idea of sonship was incompatible with the idea of Deity, and so Christ could not be "of the same substance" with God. Under the Emperor Constantius he was banished (360), but recalled in 361 by Julian and shortly after made bishop. He died in Constantinople, 367.

ÆËTIUS. A Roman general, born about 390 A.D. He long defended Gaul from the barbarians; with Theodoric he compelled Attila to raise the siege of Orleans; he followed the Huns to the plains of Châlons and defeated them in a great battle, in which 300,000 men are said to have been slain. The Emperor Valentinian III became jealous of Aëtius and slew him with his own hand, 454 A.D. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

ÆTNA, ɛt'nä. A Latin poem, in 646 hexameters, describing Mount Ætna and one of its eruptions, with a theory as to their cause. The writer was well informed in natural science. The work used to be attributed to Vergil, but was probably written by Lucilius Junior, a friend of Seneca the philosopher (q.v.), who was a procurator in Sicily. The author's views agree strikingly with those found in Seneca's *Quæstiones Naturales*; probably the latter work was used by the writer of the "Ætna," so that the work was written between 65 A.D. and 79 (the great eruption of Vesuvius in 79 is not mentioned in the poem). Consult: Munro, *Criticisms and Elucidations of Catullus*; also *Ætna; Revised, Amended and Explained* (New York, 1905).

ÆTNA, MOUNT. See ETNA, MOUNT.

ÆTOLIA, ɛ-tō'li-ä (Gk. *Aitōlia*, *Aitōlia*). A district of ancient Greece, lying on the north coast of the Gulf of Corinth. The ancient Ætolia was

divided from Acarnania on the west by the river Acheloiis, and extended as far east as the river Daphnos, where it was bounded by Locris and Doris; on the north it bordered on Thessaly and Epirus. In later times these boundaries were extended considerably to the north and the east. The country now has few cities and is generally wild and barren, though the southwest portion (old Ætolia) contains two marshy but fruitful plains—one on the coast, the other north of Mount Zygos, largely occupied by the lakes Apokuro (Trichonis) and Zygos (Hyria). This was the Ætolia of the Heroic Age; in that age the Ætolians play a conspicuous part; it was in Calydon that, according to the legend, Meleager (q.v.) slew the boar. When the Ætolians next appear in Greek history, at the time of the Peloponnesian War, they are described by Thucydides as rude and barbarous. The Ætolian confederacy, first mentioned in 314 B.C., but of unknown, though undoubtedly much earlier, origin, became important in the time of the Achæan League. (See ACHÆA.) The supreme authority was the general assembly of all Ætolians, which met yearly after the autumnal equinox at Thermon and elected the general and other officials. During the third century B.C. the league steadily increased its power, in conflict with the Achæans and Macedon, and, finally, in pursuance of its characteristically selfish policy, entered into alliance with the Romans, about 200 B.C. As this did not yield all that was expected, it afterward joined Antiochus and Perseus in their wars against Rome. The political influence of Ætolia was destroyed in 189 B.C. by the Romans, though the league existed nominally even to the time of Sulla. With Acarnania, Ætolia now forms a province (nomarchy) of the modern kingdom of Greece. The chief rivers of Ætolia are the Aspropotamo (Acheloiis) in the west, the Phidaris (Euenos) in the centre, and the Marnos (Daphnos) in the east. The people in the plains are employed in agriculture and fishing; in the mountain districts some traces of the rude and martial character of ancient Ætolia may still be found. The chief towns are Mesolonghi (where Byron died), Lepanto, and Agrinion. Consult: Oberhammer, *Akarnanien, Ambrakia, Amphilochien, Leukas im Altertum* (Munich, 1887). For the language of ancient Ætolia, see Collitz, *Sammlung der Griechischen Dialectinschriften*, vol. ii, 1409–1428 b; W. J. Woodhouse, *Ætolia* (Oxford, 1897).

ÆTO'LIAN LEAGUE. A confederacy of the tribes of Ætolia and afterward including also parts of Acarnania, Locris, Thessaly, etc. Its executive officers were chosen at a yearly meeting called Panætolicum. It was formed after the battle of Chæronea (338 B.C.) to resist the encroachments of Macedon, to which, after the death of Alexander, it proved a serious antagonist, as well as to its rival, the Achæan League. (See ACHÆA.) Later, for a time, it was in alliance with the Romans, but, having taken part with Antiochus III against them, it lost its power upon his defeat, 189 B.C.

AFANASIEFF, ä'fä-nä'syëf, ALEXANDER NIKOLAYEVICH (1826–71). A famous student of Russian folklore and national poetry. He received a good education at the Moscow University, where he pursued the study of law with great credit and success. Thus, on completing his course, he at once entered the Department of Foreign Archives at Moscow—a position for which he was eminently fitted by taste and

training. This was in 1849, when he was but 23. At 30 Afanasieff became the head of his department. Soon the supervision of the government's Bureau of Printing also fell to his lot. It was during these years—and he remained in these positions till 1862—that most of his literary work was done. Besides scores of essays and historical articles contributed to the foremost Russian periodicals, Afanasieff has to his credit several monumental works, among them *The Ancient Slav's Poetic View of Nature* (3 vols., Moscow, 1866–69), *Russian Tales and Fables for Children* (3 vols., Moscow, 1870). In 1862 he seemed to have incurred the government's displeasure by his political activities and had to give up his lucrative posts. The struggle for existence that followed proved unfavorable both to his health and literary activity. He died at the age of 45, but little appreciated in his own land.

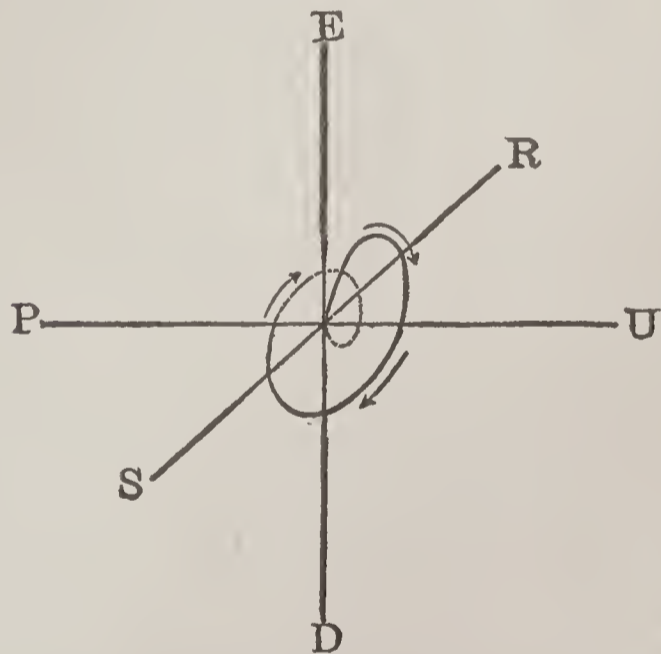
AFAR, ä'fär. See DANAKIL.

A'FER. See ARNOBIUS.

AFER, CN. DOMITIUS. A Roman orator, teacher of Quintilian. He was born at Nemausus (Nîmes) in Gaul, about 15 B.C. and died 59 A.D. He was made a consul by Caligula.

AFER. See TERENCE.

AFFEC'TION, AFFECTIVE PROC'ESSES (Lat. *affectio*, a state of mind produced by some influence, from *afficere*, to do something to one, *ad*, to + *facere*, to do). For many centuries psychologists have discussed the phenomena of the human mind under the three headings of Intellect, Feeling, and Will. (See PSYCHOLOGY.) One of the chief aims of modern psychology is to analyze the experiences thus designated into their simplest component processes and so finally to reach the mental elements, the ultimate and



AFFECTIVE PROCESSES.

Wundt's Scheme of the Affective Processes. *P, U*, Pleasantness, Unpleasantness; *E, D*, Excitement, Depression; *S, R*, Strain, Relaxation. The curved line represents the course in consciousness of an actual feeling.

irreducible constituents of mind. The various forms of intellectual experience (perception, idea, association of ideas, etc.) reduce, on such analysis, to the sensation (q.v.); the various forms of feeling (emotion, passion, mood) to the affection; while the simplest will-processes are found to contain both sensational and affective elements.

Affection, then, is the mental element which characterizes all varieties of our emotional life. It is the last result of the analysis of joy and sorrow, love and hate, anger and fear; it forms the common basis of the sense-pleasures of eat-

ing and drinking, and of the highest æsthetic appreciation of music and painting. Like sensation, it is the product of scientific abstraction; it is never experienced singly, but always in connection with other processes. And, like sensation, it cannot be reduced to anything simpler than itself. Many attempts have been made, in the interests of scientific economy, to derive it from sensation, which would then remain as the only mind-stuff, the sole material of which the mind is built. Stumpf, for example, identifies affection with a certain kind of sensation; pleasantness, he says, is a diffuse sensation of tickling, or a weak sensation of lust; unpleasantness is a low intensity of cutaneous or organic pain. The principal objections to this theory are that both tickle and pain have each a quality of its own, so that to describe either by the term "pleasant" or "unpleasant" is not to describe it at all. Furthermore, the affective quality which accompanies these sensations may change while the specific quality which characterizes them remains unchanged; for example, tickle, with change of circumstances, may be either pleasant or unpleasant, while the specific quality which distinguishes tickling from itch, pain, or any other sensation remains the same.

As to the different kinds or "qualities" of affection, modern psychology is divided. Some psychologists maintain that the manifold forms of affective experience are traceable, in the last resort, to the two typical processes of pleasure and pain, or, in the better phraseology—since pain (q.v.) is a sensation, with a definite organ in muscle and skin—to pleasantness and unpleasantness. Relief, despair, hope, satisfaction, anxiety, resentment would then be, as pure feeling and at any given moment of their course, either simply pleasant or simply unpleasant. There are two principal objections to this view: (1) that it does not do justice to the immense complexity and variety of the emotions; and (2) that it confuses the lower with the higher, the pleasure of a good dinner with that of Beethoven's *Ninth Symphony*. The latter point is very differently taken by different psychologists. One says, e.g., that the unpleasurableness of a toothache, of an intellectual failure, and of a tragical experience is so patently diverse that assertions to the contrary require no criticism. Another declares as positively that there is no qualitative difference discoverable between the pleasantness of a color and that of a successfully concluded argument, when careful abstraction is made from the very wide differences in their attendant circumstances. And so the matter rests. The former objection, however, has suggested a more elaborate classification of the affective qualities.

According to this second view, the number of affective qualities is as large as, if not larger than, the number of sensations. We have, it is true, no names for the great majority of them; but that is because language has been developed, not for the sake of a scientific psychology, but for purposes of practical intercourse, and for all practical purposes the discrimination of the main emotional types (anger, fear, and the rest) has been sufficient. We can, however, distinguish three main trends or directions of the affective consciousness, within each of which a long series of ultimate qualities is ranged between opposed extremes. These directions are those of (1) pleasantness-unpleasantness; (2) excitement-depression (tranquilization, inhibition); and (3) tension-relaxation (resolution). The first series

of qualities comprises the affections of the present time; our affective state, as determined by the occurrence of any given moment, is one of pleasure or displeasure. The second series contains all the shades and tints of our affective anticipation of the future; we are aroused or subdued by what is to come. And the third series represents the effects of experiences just past; we are kept on the stretch, or relieved from our tension, by what has just happened. Or—to put the differences from another point of view—we are pleased or displeased by the *character* of our experience; we are excited or tranquilized, according as it is more or less *intensive*; and we are held on the strain of expectation, or relieved from this strain, according as it lasts a longer or a shorter *time*. Affections of all three types are, as a rule, combined in the concrete feeling, in "real" affective experience. Suppose, e.g., that one is looking forward to a pleasant event. One has, at first, a feeling of tension, to which are soon added, in succession, feelings of unpleasantness and of excitement. All three affections increase gradually in strength until the expected event occurs. At that moment the unpleasantness changes to pleasantness, and the strain to relaxation, while the excitement is still continued. Presently the excitement dies away. Then the feeling of relaxation or satisfaction fades out; and finally the effect of the event passes off altogether, with the fading of pleasure to its indifference-point.

It would seem, then, that expert opinion could hardly be more sharply divided. On the one hand, we have the belief in two and only two affective qualities, homogeneous throughout the affective life; on the other, the suggestion that there are many thousand feelings, each of which is unique in quality, though the whole number fall roughly into three great groups. It should, however, be said that these conflicting views are held tentatively, not dogmatically. It is generally agreed that we do not as yet possess the data for a scientific theory of affection. The appeal lies to experiment; and the application of experimental method in the sphere of feeling is extraordinarily difficult. Nevertheless, the problem stands to-day in the forefront of psychological inquiry, and much may be expected from the near future.

We have, as things are, two principal methods for the study of affection: the method of impression and the method of expression. The former we owe to Fechner (q.v.); the latter to the Italian physiologist A. Mosso. (1) The method of impression in its original form is also known as the serial method or the method of selection. (See *ÆSTHETICS, EXPERIMENTAL*.) A long series of graded stimuli (colors, textile fabrics, ovals, or crosses) is laid before the observer, who notes his preference for particular terms in the series. From these preferences a curve may be constructed, showing the relative feeling-value of dull and brilliant colors, of rough and smooth surfaces, etc. In its later form the method is known as that of paired comparisons. The stimuli are here presented to the observer two at a time, so that every term in the series is compared with every other term. The experimenter records the number of preferences that each term receives, and a curve is platted from the results. It is found, e.g., in work with colored impressions that saturated colors (red, blue) are as a rule preferred to unsaturated (pink, brown, sky blue, navy blue), but that

there is a curious uncertainty as regards yellow—some observers ranking this color very high, while others as decidedly prefer orange (yellowish red) and yellow green. (2) The method of expression, on the other hand, seeks to reconstruct the affective consciousness from a study of its bodily symptoms or manifestations. It is a matter of common knowledge that men blush with shame and tremble with fear. The bodily indications of affection are, indeed, both widespread and easily observable, while at the same time they appear to reflect the most subtle and delicate phases of affective process. Their common cause is to be found in changes of muscular innervation; the whole muscular system, voluntary and involuntary, answers to those changes of nervous excitation which correspond, on the physical side, to changes in our state of feeling. Recourse has therefore been had to the various physiological instruments which register the systemic effects of such excitatory changes. Appeal has been made to the sphygmograph, which records the height and frequency of the pulse (change in the innervation of the heart); to the pneumograph, which records the depth and rate of respiration (change in the innervation of the respiratory muscles); to the plethysmograph, which records the volume of a limb or member, of arm or finger (change in innervation of the superficial blood-vessels, and therefore of the amount of blood contained in them); and to the dynamometer or dynamograph, which records the grip or pull exerted by the voluntary muscles. In spite of the attention which this method has received, psychologists are as yet far from unanimity as regards its value or its results: the simple correlations between the physical and the mental, made out for pleasantness and unpleasantness by the earlier workers, have not been confirmed by more recent researches. A correlation does, perhaps, obtain with some definiteness in the case of involuntary movement. If the hand is laid upon the plate of a planchette while our mood is one of indifference, the pencil will make a little ragged spot upon the paper, but will take no definite direction. Let a pleasant stimulus be given and the arm travels away from the body, as though the organism were reaching out after the pleasing object; the pencil traces a steady line outward. Let an unpleasant stimulus be given, and the arm comes in toward the trunk, as if the organism were shrinking from the displeasing object; the pencil traces a steady line inward.

There are, however, four reasons why this method of expression has not determined the number of affective qualities. In the first place, the method is still very young, and the technical difficulties involved in the giving of stimuli have not yet been fully overcome. Several of the instruments ordinarily used are too crude for the tasks imposed on them. Secondly, the method presupposes that the subject of the experiment is in a normal, indifferent state, and the regulation of this state is exceedingly difficult. Thirdly, knowledge of the physiological mechanism of the curve variations is at present incomplete: we have reason to believe that a particular feeling must always be connected with a particular change of innervation, although such a change may be wrought wholly within the physiological sphere. Fourthly, the expressive method gives us the expression, so to say, not only of affection but also of sensation; the organic reaction consequent upon the applica-

tion of a sensory stimulus, as such, is both complicated and far-reaching. Hence, so long as introspection gives no decided verdict, the bodily symptoms may and will be differently interpreted. The correlation of physical and mental in pleasantness and unpleasantness has not yet been satisfactorily made out. An elaborate correlation has been suggested by those who hold the alternative theory, of a large number of ultimate affections. On this view, pleasantness is indicated by strong and slow, unpleasantness by weak and rapid, heartbeats. We must suspend judgment until further evidence is submitted.

It remains to consider the nature of the physiological processes that underlie the appearance of an affection in consciousness. Sensations are conditioned directly upon the excitation of a determinate sense-organ. Affections, in all probability, are conditioned by excitatory processes which arise indirectly, by way of reaction, from these first processes. The secondary excitations may be supposed to originate within the cerebral cortex, though some psychologists have referred them to the medulla, or even to the sympathetic system; but whether they are localized (Wundt) or diffused (Meynert), we have no means of deciding. The English school have found a biological sanction for their traditional doctrine of pleasure-pain in the law that whatever is pleasurable tends to further and perfect life, and whatever is painful to disturb or destroy it. The law appears to be substantially true. Expressed in psychological terms, it would run somewhat as follows: A pleasant stimulus is a stimulus of moderate intensity, permitting the full exercise of attention, and connecting with the organic sensations set up by "anabolic" bodily processes; an unpleasant stimulus is one the intensity of which is adverse to maximal attention, and which connects with the organic sensations set up by "catabolic" bodily processes. Pleasantness and unpleasantness would then be conditioned, in the last resort, upon the *intensity* of stimulus: a result which accords well both with the results of experiment and with the notion of a diffused cortical reaction as substrate of the affective process. On the other hand, as we have seen, later theory connects pleasantness and its opposite with the quality, excitement-depression with the intensity, and tension-relaxation with the duration of stimulus. No one has yet attempted to work out these correlations upon the biological or teleological side. Here, as before, we must look to the future for a settlement of the questions at issue.

Consult: for the theory of the three affective directions, W. Wundt, *Outlines of Psychology*, translated by C. H. Judd (Leipzig, 1897, 3d ed., 1907); for methods, O. Kuelpe, *Outlines of Psychology* (London, 1909); E. B. Titchener, *Feeling and Attention* (New York, 1908); for the teleological law, H. Spencer, *Principles of Psychology* (New York, 1890), and *Principles of Ethics* (New York, 1892).

AFFIDAVIT (perf. of Low Lat. *affidare*, 'he has made an oath,' from Lat. *ad*, to + *fides*, faith). A written declaration, or statement of fact, made before a magistrate or other person legally authorized to administer an oath, the truth of which is confirmed either by an oath sworn or a solemn affirmation. The name and designation of the party making the affidavit are written at length, and he usually signs it

at the foot. When the paper is shown to him, he is required to swear or affirm that its contents are true, and that the name and handwriting are his, and it is thereupon attested by the officer before whom it is made. Affidavits in all the English courts must be taken and expressed in the first person of the deponent. In the United States, all judges, justices of the peace, notaries, commissioners, and some special officers have authority of law to take affidavits. All the States appoint commissioners, residing in other States, to exercise the power. Generally the authority of foreign officials to take affidavits must be certified or verified in court. When a judge takes an affidavit in court, his signature must be authenticated. American ministers and consuls abroad have power to take affidavits, and so have British consuls and nearly all similar officers. No particular form of affidavit is prescribed. An *affidavit of merits* is one made by a defendant in an action which sets forth that he has stated his case to counsel and is by him advised that he has a good defense to the pending action on its merits. This is required in certain cases to protect plaintiffs from delay by frivolous shows of defense, but does not always effect the purpose.

AFFIL'IA'TION (Low Lat. *affiliatio*, adoption as a son or daughter, from Lat. *ad*, to + *filius*, son, *filia*, daughter). In the civil or Roman law, the ascertainment of the parentage and determination of the descent of a person, either through the mother or the father. In our law the term is commonly used to designate the proceeding for the judicial determination of paternity, especially of the paternity of bastards. (See **BASTARD**.) In cases where the person seeking to establish his paternity was born during coverture, i.e., in lawful wedlock, there is a presumption of law that the husband was the father, which cannot be rebutted by direct evidence to show that there was no cohabitation, but only by proof that, owing to absence abroad, or in prison, or on the high seas, no cohabitation could have taken place or that it was physically impossible, or establishing beyond a reasonable doubt that the husband could not have been the father. In French law, the term "affiliation" refers to a customary mode of adoption prevailing in some parts of France. See **FILIATION**.

AFFIN'ITY (Lat. *affinitas*). The relationship created by marriage between the husband and the blood-relations of the wife, and between the wife and blood-relations of the husband. It is to be distinguished from consanguinity, which signifies relationship by blood. There can be no inheritance by legal succession from a relation by affinity. The relations of the wife stand to the husband in the same degree of affinity in which they stand to the wife by blood or consanguinity, or vice versa. But between the relations of the two parties by affinity there is no affinity. Thus, there is no affinity between the husband's brother and the wife's sister, and, by our law, there is no impediment to their marriage. The question as to whether those who are related by affinity stand in all respects in the same position as regards marriage as those who are connected by blood is one on which some difference of opinion at present prevails. Marriage between a man and the sister of his deceased wife was until recently forbidden in England by statute, but is permitted in the United States and the British colonies, as well as in most

continental countries. See **CONSANGUINITY**; **MARRIAGE**, and the authorities there referred to.

AFFINITY, CHEMICAL. A term used to denote, on the one hand, the cause or "driving power" of chemical reactions and, on the other hand, the force that holds in combination the constituent elements of chemical compounds. Considering chemical reactions, the questions suggest themselves: How are we to measure the amount or intensity of their chemical affinity? Since most reactions are accompanied by the evolution of heat, are we to conclude that affinity is proportional to the amount of heat evolved? Or, since some reactions proceed with explosive rapidity, while others are extremely sluggish, are we to assume that the affinity of a reaction is proportional to its velocity, and therefore measure affinity by measuring velocity? But speculation on the subject is to-day no longer necessary, for thermodynamics furnishes us here with a definite and indubitable principle. It teaches, namely, that any process or change whatever which takes place of itself, as does a chemical reaction, can be harnessed to do mechanical work; that any system in process of transformation must contain energy available for such work—"free energy," as it is called; and that this free energy is the obvious cause of the transformation itself. The affinity of a reaction can thus be measured with certainty by measuring the maximum mechanical work that could be furnished by it. Van't Hoff (q.v.) has shown that the maximum work or affinity of a reaction can be calculated from the relative concentrations of the reagents and reaction-products present together when the reaction has reached equilibrium. (See **REACTION, CHEMICAL**.) On the other hand, J. Willard Gibbs (q.v.) and Helmholtz (q.v.) have shown independently of each other that the maximum work or affinity of a reaction is equivalent to the electromotive force of a galvanic cell whose working depends on the given reaction. (See **ELECTRO-CHEMISTRY**.) And so we have to-day two independent methods for measuring the affinity, or driving power, of chemical reactions, and both are capable of great experimental precision. This phase of the affinity question is thus freed from its old-time mystery.

Still, it may be asked further: But what is the *form* in which free energy is contained in mixtures undergoing chemical change? Hydrogen and oxygen gases combine to give water; a mixture of hydrogen and oxygen must therefore have free energy not possessed by their compound. Is it that the atoms vibrate faster within the molecules of the free gases than they do in the water molecule? Or is the free energy still more deeply hidden as "potential energy" in the ether itself, as energy is hidden when a weight is suspended above ground?

That atoms move within the molecules is more than a plausible assumption. Unfortunately, no one has yet succeeded in correlating any such assumption with experimental facts, and nothing is scientifically known regarding that motion. The potential energy idea, too, remains in the realm of speculation. In recent years, however, attempts have been made to impart a practical aspect to such speculations, with the aid of assumptions concerning the nature and mode of action of the forces that hold atoms together within the molecules of chemical compounds. Such attempts are by no means

novel in chemistry. Borelli and Lemery imagined that the ultimate particles of matter are supplied with minute hooks, the shape of which determines the capacity of a particle for combining with certain other particles. Newton, Bergman, Berthollet, and others, have thought that chemical affinity might be identical with the force of gravitation. Berzelius sought to explain all chemical phenomena on the hypothesis that chemical combination is caused by the mutual attraction of electrically different particles. This last idea was abandoned before the middle of the nineteenth century. Yet now, a century after Berzelius first advanced it, the electrical hypothesis of the nature of affinity is struggling into life again—in more or less modified form, to be sure.

A strong impulse to the revival of the electric hypothesis resulted from Arrhenius's theory of electrolytic dissociation, in the 80's of the past century. Then, in the early years of the twentieth century, J. J. Thomson ingeniously developed the hypothesis that the atom itself is made up of particles of negative electricity revolving with great speed within a positively electrified sphere; and that a negative particle from one atom may attach itself to another atom, the result being a "tube of force" by which the two are bound together. Thomson gave practical value to his hypothesis by showing that a number of known but obscure phenomena, including the periodic law itself, were easily explained by it. On the other hand, organic chemists have felt more and more distinctly that their formal working-theory of valency (q.v.) has been used almost to exhaustion, and that much practical good might result from the birth of a new guiding-idea. No wonder, therefore, that speculations concerning the nature and mode of action of the affinity forces are again uttered, and even listened to, by practical investigators.

Bibliography. T. Bergman, *Traite des affinités chimiques ou attractions électives* (Paris, 1788); C. L. Berthollet, *Researches into the Laws of Chemical Affinity* (trans. by M. Farrell, Baltimore, 1809); C. M. Guldberg and P. Waage, *Studien über die chemische Affinität* (original ed., Christiania, 1864; French trans., Christiania, 1867; German trans., Leipzig, 1879); Pollitzer, *Die Berechnung chemischer Affinitäten* (Stuttgart, 1911). See bibliography of theoretical chemistry under CHEMISTRY. See also ACIDS; NERNST'S HEAT THEOREM; and especially ELECTRO-CHEMISTRY.

AF'FIRMA'TION (Lat. *ad-firmare*, to make secure). A solemn declaration, not under oath, made by a witness in open court or before an officer authorized to administer an oath in a like case, that he will tell the truth. Formerly oaths were required of all witnesses and affiants in all cases, but many exceptions are now allowed in England and in the United States. Generally all persons who declare that they have conscientious scruples about taking an oath are permitted to make an affirmation instead. The affirmation has the same effect as an oath, and for a false affirmation a witness is punishable as though he had been sworn. See OATH; PERJURY.

AFFOR'ESTA'TION (Lat. *ad*, to + Low Lat. *foresta*, a wood, forest). The converting of open or partially wooded ground into forest or woodland. See FORESTRY.

AFFRAY' (Fr. *effroi*, fright, terror, compare

Eng. *afraid*). The fighting of two or more persons in a public place in such a manner as will naturally cause terror to other people. It differs from assault (q.v.) in that it must occur in a public place, and from a riot (q.v.) in that only two persons are necessary for the commission of the offense. Two persons engaged, although in a public place, must each be guilty of unlawfully fighting the other or there is no affray. No matter how publicly, or in how terror-breeding a manner, A may attack B, if the latter does not go beyond the limits of self-defense in repelling the attack, the occurrence is not an affray, but an assault. An affray which did not develop into a higher crime, such as homicide or an attack upon a public officer, was punishable at common law by fine and imprisonment. In some of our States it is not recognized as a separate offense from assault and battery (q.v.). Consult Wharton, *Criminal Law* (Philadelphia, 1896).

AFFRE, âf'r', DENIS AUGUSTE (1793–1848). An archbishop of Paris. At the time of the Restoration he was professor of theology at the Seminary of Saint Sulpice and on account of his prudent and temperate character was made Archbishop of Paris by the government of Louis Philippe in 1840. Though not yielding a blind submission to all measures of the government, he abstained from all offensive opposition. During the insurrection in Paris in June, 1848, he climbed upon a barricade in the Place de la Bastille, carrying a green bough in his hand as a messenger of peace, and sought to persuade the insurgents to lay down their arms. He had scarcely uttered a few words, when the insurgents and the troops commenced firing again, and he fell, mortally wounded by a musket-ball. He was removed to his palace, where he died, June 27. He was the author of several theological writings and of a work on Egyptian hieroglyphics. Consult Alazard, *Denis-Auguste Affre, archevêque de Paris* (Paris, 1905).

AFFREIGHT'MENT (Lat. *ad*, to + Eng. *freight*). The contract of a shipowner for the carriage of goods in his ship for compensation, or freight. The shipper is technically known as the *freighter*. Where the freighter ships his goods in the ordinary way, without acquiring any control over the ship, the contract is a bill of lading (q.v.), and the rights of the parties are mainly determined by the laws relating to common carriers. (See CARRIER, COMMON.) Where the freighter charters the ship, the contract is known as a charter-party (q.v.) and has certain features and is subject to certain rules peculiar to the law of shipping. A complete treatment of the subject will be found in Scrutton, *The Contract of Affreightment, as Expressed in Charter Parties and Bills of Lading* (London, 1899).

AFFRONTE, â'frôn'tâ' (Fr. p.p. 'face to face,' from Lat. *ad frontem*, to the face). In heraldry, a term applied to animals represented as facing the spectator directly, as the lion in the royal crest of Scotland.

AFFU'SION, or POURING, BAPTISM BY. See BAPTISM.

AFGHAN, äf'gan, or PUKHTU (North Afghan), or **PUSHTU** (South Afghan). A modern Iranian dialect which is spoken by about 3,000,000 people. The Afghan language is divided into two great dialects, the southern and the northern. The differences between these two dialects are mainly phonological; thus, North Afghan *kh, j*, and

initial *c* = South Afghan *sh, zh, k*. The Afghan is undoubtedly an Iranian language, although it has suffered many corruptions, especially in its vowel system. The dialect has many foreign loan-words, chiefly from the Persian, and through this from the Arabic, and from the Indian, particularly Sindhi. The alphabet is a modification of that of the Arabs. The Afghan literature is scanty and dates only from the sixteenth century. The poetry is copied closely after Persian models, although there exists a great mass of popular Afghan songs of true Oriental beauty. The French scholar J. Darmesteter (1849-94) made a collection of these. Reference may be made to Geiger, *Sprache der Afghanen*, in Geiger and Kuhn's *Grundriss der iranischen Philologie*, vol. i, part ii, pp. 201-230 (Strassburg, 1898), and works cited. Consult: J. Darmesteter, *Chants populaires des Afghans* (Paris, 1888-90), which contains an historical sketch, a grammar, texts, and translation; Lorimer, *Grammar and Vocabulary of Waziri Pashto* (Calcutta, 1902); Cox, *Notes on Pushtu Grammar* (London, 1911).

AFGHANISTAN, äf-gän'i-stän'. A country in Central Asia, between British India and Persia. It is situated between lat. 29° and 38° 30' N., and long. 61° and 75° E. (Map: Afghanistan, J 4; Asia, F 5). It is bounded by Russia, Bokhara, and the Pamir on the north, British India on the east, Baluchistan on the south, and Persia on the west. Its total area is estimated at 245,000 square miles. It is generally divided into five parts: (1) The northeastern part, comprising Badakhshan, Kafiristan, and a portion of the Pamir; (2) Afghan Turkestan, in the north; (3) Kabulistan, or the region of Kabul, in the east; (4) Southern Afghanistan, which comprises Kandahar and the country south, down to the Baluchistan boundary line; (5) the province of Herat, in the west. The political divisions of Afghanistan, however, are far from coinciding with its ethnographical or geographical divisions, as there are still numerous independent khanates and tribes which do not fully recognize the authority of the ameer. Persian is spoken by a large part of the people, though the common language is mainly Pushtu—a language of the Iranian group of the Indo-European family.

Physical Features. The surface of Afghanistan is exceedingly mountainous, a great part of it being covered with the mighty chain of Hindu-Kush and its offshoots. The Hindu-Kush extends in a northeast and southwest direction for about 400 miles to the Irak and Shibar passes, where it assumes the name of Koh-i-Baba. Its highest peaks are 24,000 feet above the sea, and the passes of Irak and Shibar on the route from Afghan Turkestan to Kabul are 12,000 feet and 8000 feet high respectively. The Koh-i-Baba chain branches off into two ranges, the Safed-Koh and Siah-Koh. Another branch is sent off by the Hindu-Kush above the Sirak Pass, which is called the Paghman Mountains. They run in a southwestern direction and eventually unite with the Suleiman Mountains, which traverse the eastern part of Afghanistan. Besides the above-mentioned principal chains, there are many secondary ranges and single mountains too numerous to describe.

The principal rivers of Afghanistan are the Hari-Rúd, which flows through the Herat valley; the Helmand, the largest river of Afghanistan, which rises near the Bamian valley and flows in a general southwestern direction, entering the Lake of Hamun; the Kabul, a tributary of the

Indus, and the Amu-Daria (Oxus), which forms the northern boundary of Afghanistan.

The climate is generally healthful and dry, although there are great variations of temperature, depending largely on altitude, rising in the same place as high as 120° F. in the summer, and falling as low as -15° F. in the winter. At Kabul, with an elevation above sea level of 6500 feet, the thermometer (F.) marks 90° to 100°, while correspondingly on the higher lands the cold is intense; and the difference between summer and winter is extremely wide in all places, while at the same time the daily range is extraordinary, especially in summer. The rainfall is very scanty, even during the rainy season, and for agricultural purposes a system of irrigation, called *karez*, is maintained. It consists of subterranean channels connecting the springs with one another, by which the water is brought to the surface.

The mineral deposits of Afghanistan are supposed to be very rich, but so far the expectations have not been realized. Iron, lead, and sulphur are worked on a small scale, and gold is found in small quantities in some of the hills and rivers, while precious stones are known to exist in Badakhshan. Extensive coal beds lie in the north.

The flora is very rich in the valleys, while the mountains are all barren, except those in the north, which are covered with forests to an elevation of 10,000 feet. The main products are wheat, corn, rice, grapes, sugar, tobacco, and cotton. The country is especially famous for its fruits, which include apples, pomegranates, and peaches of an excellent quality. Vegetables are also grown to a considerable extent, and a very important product is the asafoetida, a resinous gum exported in large quantities to India.

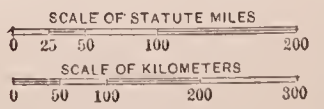
The fauna includes the leopard, wolf, bear, cheeta, hyena, jackal, various gazelles, and wild asses. Among the domestic animals may be mentioned the horse, the dromedary, ass, cow, two kinds of sheep, and the goat.

Agriculture and Trade. The soil of Afghanistan, where it is fit for agriculture, is generally very fertile and in most cases yields two crops a year. Wheat, barley, peas, and beans are sown late in the fall and ripen in the summer, while rice, millet, corn, turnips, beets, and tobacco are sown in the spring and harvested in autumn. Fruits, melons, and madder are also of importance. The breeding of domestic animals is carried on extensively, and wool forms one of the chief exports to India. Owing to the practical absence of any manufacturing industries, the exports of Afghanistan are confined largely to raw products, such as wool, cattle, silk, and dried fruit. Some rugs, felts, and silk articles are produced on a small scale. The trade is chiefly with India and Bokhara. There is no accurate system of trade registration. Indian statistics show imports from Afghanistan valued at £570,459 and exports to Afghanistan £764,274 in the fiscal year 1909; in 1912, £652,665 and £877,096. The mountainous character of the country makes the use of wheeled vehicles in most cases impossible, and merchandise is usually carried on camels or ponies.

Ethnography. The Afghans, or Pathans, speaking a language called Pukhtu, or Pushtu, form three-fifths of the population of Afghanistan. They are of mixed ancestry, although the Indic affinities of their language indicate a preponderance of Aryan blood of the Mediter-



PERSIA AFGHANISTAN, BALUCHISTAN, AND PARTS OF CENTRAL ASIA



Important towns are shown in heavy face type
Capitals of Countries (C) Capitals of Provinces (C)
Railroads (R) Telegraph and Cables (T)
Important Roads (R)

41° A 46° B 48° C 50° D 52° E 54° F 56° G 58° H 60° J 62° K 64° L 66° M 68° N 70° O 72° P 74° Q 76°

B 48° C 50° D 52° E 54° F 56° G Long 55° H East 60° J from 62° K Greenw 64° L 66° M 68° N 70° O 72° P

ranean stock. They are not Semite, as some authorities have believed, their national claim to an Israelitish descent being an afterthought, based upon the occasional appearance among them of Jewish traits. Besides a dash of Semitic blood, they have in all probability inherited some of a different sort from the earlier inhabitants of the country, who may have been akin to the Dravidians of India. Among the principal tribes are the Duranis of the west and south, Ghilzais in the east, and the Yusufzais and Afridis on the Indian frontier. Less important Afghan tribes are the Swatis, Waziris, Kakars, Khostis, etc. Some other peoples of Afghanistan, such as the Tajiks, Hindkis, Jats, Aimaks, and Hazaras (Mongolians), are not Afghans, while the Kizilbashs are largely Persianized Turks. The Afghans were already well established in their present habitat when the Greeks reached India in the fourth century B.C. Most of the Afghan and allied peoples are agriculturists, but the dominant tribes compel the inferior ones to do the work. Physically the Afghans are well developed and are of a very warlike disposition. Nearly all the tribes scattered along the east of Afghanistan and the northwest frontier of India are within the sphere of British influence. The population, according to statistics available, is about 5,000,000. See, concerning Afghan peoples and their culture: Oliver, *Across the Border, Pathan and Biloch* (London, 1890); Darmesteter, *Chants populaires des Afghans* (Paris, 1888-90). See also the excellent article on Afghanistan in *The Encyclopædia of Islam*, vol. i, pp. 146-172 (London, 1913).

Government. The government of Afghanistan is an absolute monarchy, under an ameer, an hereditary ruler whose actual power varies with his personality. The country is divided for administrative purposes into six provinces, under governors: Afghan-Turkistan, Badakhshan (including Wakhan), Herat, Kandahar, Farrah, and Kabul. The provinces are subdivided into districts, where, up to the time of the ameer Abd-ur-Rahman (d. 1901), members of the royal family and nobles ruled in feudal fashion. Abd-ur-Rahman centralized governmental authority and power at Kabul, reducing the powers of the provincial governors, and established legal codes which have been continued under his successor. Some of the tribes, however, still maintain a more or less turbulent and independent existence. The depredations of the border tribes on Indian territory have afforded the Indian government excuse and opportunity for pushing forward the military frontier. The warlike Afridis and a considerable proportion of the Pathan tribes are now under British control. Frequent conflicts have occurred between the British troops stationed on the northwest frontier, particularly those of the Peshawar district in the northwest frontier province, and the Pathan and Afridi tribes of Afghanistan. The latter are of greater political consequence because of their location, the importance of the Khyber pass to India, and the necessity of maintaining a clear road from India to Kabul.

The State revenue is probably between 120 and 130 lakhs of rupees (13,000,000) a year, of which 18 lakhs are a subsidy paid by the Indian government. Revenue consists largely of payments in kind calculated on an average year's produce. There are many arbitrary exactions and other abuses of taxation, which press heavily on the people.

Afghanistan has a regular army modeled after European fashion. Its strength is not accurately known, but it is estimated at between 50,000 and 60,000 men, including 16,000 cavalry. There is an arsenal, and an ammunition factory at Kabul is equipped with English machinery. The medium of exchange is the rupee. There is a mint at Kabul under the supervision of an Englishman, but its operation is very limited. Instruction is supplied by the Mohammedan schools. The chief cities of Afghanistan are Kabul, Kandahar, and Herat. Among the towns are Balkh, Kunduz, Maimana, Andkhui, Tashkurghan, Akcha, and Mazar-i-Sharif, Faizabal, and Jelalabad.

History. The country now known as Afghanistan was embraced in the ancient Aria. It was a part of the conquests of Alexander the Great, who, it is supposed, founded Alexandria Arion, the modern Herat, the modern Kandahar and a settlement near Kabul. Its masters changed many times in the waves of conquest that rolled over Asia. On the decline of the Bagdad caliphate it was included in the domains of the Samanides, one of the many independent dynasties that then arose in the Mohammedan world. The Samanide princes were overthrown by a Turkish tribe, who founded the Ghaznevide dynasty, and Afghanistan was a part of their realm until the fall of the Ghaznevites in 1186. It was overrun by the conquering Mongols of Genghis Khan in the first quarter of the thirteenth century, and in the last quarter of the fourteenth it was subjugated by the great Tatar conqueror Timur. In 1504 Baber, a descendant of Timur and founder of the Mogul Empire, made Kabul his first capital, and Afghanistan remained a part of that Empire until its decline. In 1722 Mahmud, an Afghan chieftain, invaded Persia, captured Ispahan, and dealt a permanent blow to the prosperity of that famous capital; but a few years later the Afghans were defeated and driven out by Nadir Kuli, a Persian soldier of fortune, who became by his great ability Shah of Persia and the last of the conquerors of Afghanistan. After the assassination of Nadir Shah (1747), one of his officers, Ahmed (see AHMED SHAH), founded the Durani dynasty in Afghanistan, and that country has since maintained an independent existence. Ahmed made considerable conquests in India and maintained a mastery over the Sikhs and Mahrattas, but established no permanent sovereignty. The Durani dynasty fell in 1809, and Shah Sujah, the grandson of Ahmed, became an exile.

Upon the fall of Shah Sujah anarchy ensued, a condition not unfamiliar to the warlike and restless Afghan tribes. The statesmanlike Dost Mohammed succeeded in establishing his authority over the eastern part of the country, with Kabul as his capital. Shah Sujah from his asylum in India carried on intrigues for the restoration of his sovereignty and succeeded in making an alliance with Runjeet Singh, the Sikh ruler. A small subsidy was also obtained from the Anglo-Indian government, and Afghanistan was invaded. The only result was to involve the Afghans and the Sikhs in unprofitable warfare, while Sujah soon returned to India. When Lord Auckland became Governor-General of India, he declared a policy of non-interference in questions concerning the native States; but in direct contradiction of this declaration, in 1838 his government actually undertook to re-

store Sujah, alleging that Dost Mohammed had attacked Great Britain's ally, Runjeet Singh—an attack, it may be noted, for which there had certainly been reason enough. It was further alleged that the military operations of the Afghans had betrayed a hostile purpose toward India; and that Shah Sujah, as the rightful heir to the Afghan throne, had placed himself under British protection. Furthermore, Dost Mohammed, unable to win recognition from Great Britain, was intriguing with Russia. A primitive expedition was determined upon. The British forces entered the country in March, 1838. Some stiff fighting was encountered, but Kabul was finally captured, Aug. 7, 1839, and the conquest was regarded as complete.

In this, however, as in all their dealings with the Afghans, the British showed an entire misunderstanding of the nature of the country and the character of the people. The land had been invaded, but was by no means conquered. Dost Mohammed had surrendered to the English; but his son, Akbar Khan, was actively engaged in a conspiracy, of which the British envoy, Sir William Macnaghten, and his successor, Sir Alexander Burnes, were not aware until it was too late. Early in the winter of 1841, when help from India was impossible, the outbreak took place at Kabul. Burnes, Macnaghten, and several British officers were slain. It was then agreed that the invaders should leave the country; while, on the other hand, Akbar Khan and his confederates stipulated to provide an escort and make other necessary arrangements for the retreat. Depending on these promises, the British army left Kabul on Jan. 6, 1842, in order to return by the Khyber pass into India; but neither escort nor provisions were supplied by the Afghan leaders, and the severity of the season increased the misery of the retreat. The fanatical tribes of the districts harassed the flanks and rear of the army. To escape total destruction, the women and children, together with the married men, surrendered to Akbar Khan, and out of the 16,000 souls that had set out from Kabul, only one man (Dr. Brydon) escaped to carry the dismal tidings to General Sale, who still held his position at Jelalabad. Almost against his own will, the new Governor-General, Lord Ellenborough, sent other forces into Afghanistan. General Nott held out at Kandahar, while General Pollock, at the head of the invading army, forced the Khyber pass, relieved General Sale, and effected a victorious march to Kabul, which he entered in September. The English officers and the women who had surrendered as prisoners to Akbar Khan were restored to liberty, and soon afterward the troops marched back to India. It was believed that the Afghans were deprived of all power to confederate against the government of India; but this conclusion was too hasty, for in 1846 they formed an alliance with the Sikhs against the British, Dost Mohammed being released and permitted to reoccupy his throne. After the decisive battle of Gujerat (Feb. 21, 1849), the Sikhs were forsaken by the Afghans, and Dost Mohammed, with about 10,000 men, fled over the Indus. After this period Dost Mohammed devoted his attention almost exclusively to the consolidation of his dominions, governing well and always seeking to maintain friendly relations with the Anglo-Indian government. He died in 1863, appointing Shere Ali, one of his younger sons, as his heir. At first the choice

was acquiesced in by the 16 sons of Dost Mohammed, a large number of whom were governors of provinces; but disputes followed, which for many years kept Afghanistan in a state of anarchy. (See KABUL.) The British government of India had recognized Shere Ali at his accession, and it was the policy of Lord Lawrence's administration in India to abstain from any interference with Afghan affairs. Lord Mayo assumed a like attitude. The claims of Shere Ali's son Yakub to share in the government were ignored, and in 1870 he headed a rebellion against his father; but in the following year a reconciliation was effected through the intervention of England. In 1869 it was settled between England and Russia that all the territory between the Amu-Daria and the Hindu-Kush should be treated as part of Afghanistan. The British conservative government which came into power in 1874 was totally opposed to the policy of non-interference; Russia had already annexed Bokhara and Khiva, and her influence was predominating at Kabul. The Indian government therefore was ordered to insist upon the reception of a British resident at Kabul. This demand was made imperatively in 1878, when a Russian mission had been received. The Afghans were bitterly opposed to any more British residents, and the refusal of the ameer to receive the mission led to the second Afghan war, which in many ways was a repetition of the first, although the disasters were somewhat mitigated. The British invading columns forced the Khyber pass and were victorious at the Peiwar pass, and occupied Jelalabad before the end of 1878. In January, 1879, they entered Kandahar. A few weeks later Shere Ali died, and his rebellious son, Yakub, whose cause had been taken up by the British, was proclaimed ameer and concluded the Treaty of Gandamak with them in May. It was provided that there should be a British resident at Kabul, and that Great Britain should defend Afghanistan against foreign aggression, the ameer receiving a subsidy. The Kuram, Pishin, and Sibi valleys became British territory, and the Khyber pass came under British control.

The peace did not last. In September of the same year there was a revolt in the capital, the British resident, Sir Louis Cavagnari, and his suite were murdered, and the British troops, which were on the point of withdrawing from the country, were compelled to renew the campaign. The Kabul army under General Roberts was the strongest column and held the key to the situation. General Burrows was defeated by the Afghans in July, 1880, and compelled to retreat to Kandahar, which seemed likely to be captured. It was saved by the brilliant march of General Roberts with a strong force from the main army, a march which won for him a peerage with the title "Lord Roberts of Kandahar." Abd-ur-Rahman (q.v.), having been accepted as ameer by the Afghan chiefs, was recognized by Great Britain, which abandoned its claim to maintain a permanent mission at Kabul and agreed to pay to the ameer an annual subsidy of 12 lakhs of rupees (about \$400,000). Abd-ur-Rahman established his government firmly and maintained a good understanding with Great Britain while not antagonizing Russia. In 1893 he concluded the Durand agreement with the Indian government, in which he recognized the Chitral, Bajaur, and Swat as within

the sphere of British influence and withdrew his pretensions to Waziristan. Great Britain in return abandoned its claims upon Kafiristan, which was subsequently occupied by the Afghan forces, and increased its subsidy to 18 lakhs (about \$600,000). Abd-ur-Rahman died Oct. 1, 1901, and was succeeded by his son Habib Ullah (q.v.). The treaty with Great Britain was renewed, and in 1907 an Anglo-Russian compact was drawn up whereby Great Britain acknowledged Afghanistan's independence. In 1910 the Indian government and Afghanistan agreed to leave their disputes to a joint commission.

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AFIUN-KARA-HISSAR, ä'fê-ōn'kā-rä'hīs-sär' (Turk. Opium Black Castle). A city of Anatolia, Asiatic Turkey, 170 miles northeast of Smyrna (Map: Turkey in Asia, D 3). It is surrounded by rocky hills, on one of which are found the ruins of a castle. The town contains several mosques and Armenian churches. It manufactures saddlery, woolen carpets, and opium, the latter being one of the chief articles of commerce, from which the town derives its name. The trade is considerable because of its situation on several caravan routes and its railway connection with Smyrna, Constantinople, and Konieh. Pop., about 20,000.

AFRAGOLA, ä'frä-gō'lä. A city in south Italy, 5 miles northeast of Naples, noted for the manufacture of straw goods. Pop., 1881, 19,000; 1901, 22,438; 1911, 22,822 (comune).

AFRA'NIUS, LUCIUS. A Roman poet and playwright, who lived about 100 B.C. He was praised by Cicero and Quintilian for the excellence of his plays, which were known as *fabulæ togatæ*, i.e., comedies on Roman subjects, laid on Roman soil; only the titles and a few frag-

ments survive. They are collected by Ribbeck, *Comicum Romanorum Fragmenta* (Leipzig, 1898).

AF'RICA (Lat. *Africa*, from *Afer*, inhabitant of Africa; of uncertain derivation, possibly of Phœnician origin. It seems to have been originally the designation of Carthage, as the colony of Tyre, and later extended to the whole continent. It is certain that the name "Africa" was first applied to the neighborhood of Carthage—the part first known to the Romans—and *Afrygah*, or *Afrikiyah*, is still applied by the Arabs to the land of Tunis). A continent of the eastern hemisphere, and in point of size the second of the great land divisions of the globe, with an area of about 11,262,000 square miles, exclusive of islands. Africa is an independent continent in even less degree than is either of the two Americas, for it forms the southwesterly extension of the Old World land-mass, and it lies in close proximity to Asia and Europe, with both of which continents it has, during long periods of past geological time, been intimately united by broad isthmuses. In form Africa consists of two parts—a northern ellipsoid, with an east and west longitudinal axis, comprising the Sahara-Sudan region, and a southern triangular limb attached to the southern side of the eastern half of the northern portion, and consisting of the Congo region and the South African highlands. Somewhat north of the middle point of the eastern side of the continent, a massive triangular projection, the Somali Peninsula, extends almost 1000 miles toward the Indian Peninsula of Asia. The extreme length of Africa from Cape Blanco in Tunis (lat. 37° 20' N.), its most northerly point, to its southern termination, Cape Agulhas (lat. 34° 51' S.), is about 5000 miles in an almost north and south direction; and its greatest width from its western outpost, Cape Verde (long. 17° 30' W.), to its eastern apex, Ras Hafun, on Cape Guardafui (long. 51° 28' E.), is about 4500 miles in an almost west and east direction. The northern and southern points of the continent are almost equidistant from the equator, so that Africa, compared with South America, has a greater proportion of its area situated in the torrid zone.

At its northeast corner, by the Isthmus of Suez, Africa has a geographic union 90 miles wide with Asia. Until a comparatively recent period it had a much closer union, for the Red Sea and the Gulf of Aden now occupy the deep, narrow basin of a rift valley that has been formed since Pliocene time. On the north the Mediterranean Sea separates Africa from Europe by a wide and deep basin that is restricted at its western end, so that the shores of Spain and Morocco approach to within about 9 miles of each other. Africa and Europe were once united at this point, but were later separated by the continental fracture now occupied by the Strait of Gibraltar. This northern Mediterranean coast is broken only by the broad and shallow embayment that holds the gulfs of Gabes and Sidra. The western extension, from Gibraltar to Cape Palmas, projects into the Atlantic Ocean with a regularly rounded coast line that is almost unbroken by bays or peninsulas, capes Blanco and Verde being inconspicuous projections. From Cape Palmas the coast runs eastward along the north shore of the Gulf of Guinea for about 1200 miles to Kamerun and thence in an undulating line, slightly east of south, for nearly

3000 miles to Cape Agulhas at the southern extremity of the continent, where the Atlantic and Indian oceans meet. The eastern coast of the southern limb, washed by the Indian Ocean, extends from Cape Agulhas with gentle curves for 3600 miles to Cape Guardafui at the apex of the Somali Peninsula.

The coast line of Africa is peculiar in that it presents a remarkably even front, almost unbroken by bays and peninsulas, contrasting strongly in this respect with the coast lines of Europe, Asia, and North America, but resembling that of South America. The length of the coast line of Africa, 18,400 miles, bears a smaller proportion to the shortest possible periphery of a regular figure of its own area (the proportion is 1.8 to 1) than does that of any other continent. It is so compact in shape that with an area about three times that of Europe its coast line is about 1000 miles shorter. The only irregular portion of the coast line is on the northern edge, where the Atlas Mountains send spurs into the Mediterranean Sea. This regularity of the shore line is undoubtedly due to the plateau character and the stability of the larger part of the continent, which during great periods of geological time has stood emerged at approximately the same level above the ocean.

Islands. In connection with the regularity of the coast line, it is of interest to note the small number of islands adjacent to this continent, and also the small proportion of these that have any physical relations with the mainland. Madagascar, off the eastern coast, is the only large island near the continent; it was at a distant period of geological time an integral part of the mainland, but it is now separated from it by the Mozambique Channel, which appears to be a rift valley analogous to that of the Red Sea. The Seychelles, the islands in the vicinity of Zanzibar (Mafia, Zanzibar, and Pemba), and Socotra, off the apex of the Somali Peninsula, may be considered as fragments of the continental mass, while many of the small islands along the east coast, including those in the Red Sea, are of volcanic and coral reef origin and rise apparently from submerged portions of the continental plateau. On the Mediterranean coast the islands of Jerba and Kerkenna in the Gulf of Gabes were formerly united to the mainland, and in past geological times even the island of Sicily was part of a chain of folded mountains that extended from the Tunisian highlands north-eastwardly across the Mediterranean Sea. Off the western extension, the Madeira, Canary, and Cape Verde archipelagoes are of volcanic origin, and appear to lie on the outer submerged slope of the continent, perhaps marking lines of folding and fracture that are extended under the ocean level. The Bissagos group, thirty in number, lying a short distance south of Cape Verde, are small fragments of the mainland. From the Bissagos group, the coast is free from islands as far as the head of the Bight of Biafra, where four volcanic islands, Fernando Po, Principe, St. Thomas, and Annabon, extend in a southwestward direction from Mount Kamerun on the coast. Southward from this point the coast has but few islands, and these of small size, all the way to the Cape of Good Hope; and this same condition, in even more marked degree, is continued along the eastern coast for 2500 miles to the island of Mafia. The small extent of Africa's island territory is expressed

by its proportion to the mainland area, which is as 1 to 48.

Topography. The typical expression of African topography is that of a plateau that rises here and there by successive terraces to increasing elevations up to and beyond 4000 feet, which altitude is the general level of the highland region that covers a large part of the southern and eastern portion of the continent. The edges of the continental mass are, as a rule, somewhat more elevated than is the interior, and the plateau rims approach close to the sea. Only along the eastern part of the Mediterranean shore and along that part of the Atlantic seaboard between Cape Juby, near the Canaries, and Freetown, can there be said to exist a coastal plain that extends for any considerable distance toward the interior. Swampy districts of limited extent are found along the upper Guinea shore and on the east coast about the mouths of the Zambezi River, and a lowland borders the south side of the Somali Peninsula. The mean elevation of Africa, obtained by a reduction of all irregularities of the surface, has been computed by Prof. H. Wagner to be 2130 feet, which is 160 feet more than that of South America and 170 feet less than that of North America, while it is greatly exceeded by the mean elevation of the Eurasiatic continent.

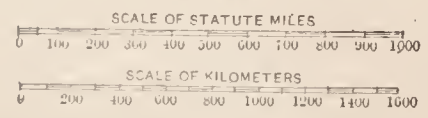
The topography of the interior presents over large areas a marked uniformity of expression, though different regions exhibit distinctive features. The general plateau character of the surface is broken in the interior of the continent by four areas of depression which in the south and north are occupied by basins of internal drainage. In the southern highland is the Kalahari-Ngami Desert (altitude 2250-3000 feet); the central plateau falls toward its middle to form the Congo Basin (altitude 600-1600 feet); in the central Sudan the Lake Chad (altitude 900 feet) and Bodele (altitude 500 feet) depressions receive the drainage of a great interior region that has no outlet to the sea; and in the northwestern Sahara several inclosed basins lie at altitudes of from 400 to 600 feet above the ocean.

Africa is divided topographically into the following regions: (1) the elevated Southeastern Highlands, (2) the Sahara and Sudan plateau of lower level that covers the entire central and most of the northern part of the continent, and (3) the narrow, comparatively small area of the Atlas Mountains on the extreme northwest coast. On the whole, the general slope of the surface is from the southeast to the northwest.

The highest portions of the continent, called the Southeastern Highlands, lie near the eastern coast and in the lower end of the southern limb. They are limited on the north by an irregular line that may be drawn from Loanda on the west coast, at the mouth of the river Kuanza, eastward to Ankoro on the Upper Congo, thence northward to Daruma, and through Lado and Kassala to Suakin on the Red Sea. Northward from Suakin the eastern highland is continued as a narrow ridge of lower elevation along the western shore of the Red Sea almost to Cairo. This great highland region may be topographically considered to form the backbone of the continent, though it is scarcely that in a geologic sense, for the rocks of which it is composed lie generally horizontal, and the differences of topography are the result of long-continued erosion and denudation rather than of mountain-



PHYSICAL MAP OF AFRICA



- ELEVATIONS
- Land below 500 feet
 - Land between 500 and 2000 ft.
 - Land between 2000 and 5000 ft.
 - Land above 5000 feet
- OCEAN DEPTHS
- 0 to 5000 feet
 - Below 5000 feet

Longitude 30 West from 10° Greenwich 0° 10° C of Good Hope 30° Longitude 40° East from 50° Greenwich 60°

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making forces. This highland has an elevation of over 4000 feet, and above this height rise numerous isolated and grouped peaks to altitudes of 10,000 feet and over. The majority of these high peaks are remnants of a dissected plateau of still higher level, while others are volcanic mountains that rest upon the tableland and rise above it to still greater heights of from 12,000 to 19,000 feet. The central depression of the Kalahari Desert and Ngami Basin in the southern part of the highland, and the deep valleys cut by the rivers that drain this interior basin, serve to divide this southern region into four well-marked isolated plateaus. The most southerly plateau occupies the Cape of Good Hope, Natal, Transvaal, and Orange Free State, provinces of the Union of South Africa and their seaward edges, known as the Roggeveld, Schnee, Zwarte, and Drakensberg mountains, which rise in single peaks of 9000 to 11,000 feet. North of the Transvaal, between the Limpopo and the Zambezi valleys, is the less extensive plateau of Matabeleland, with an average level of 4500 feet and a single peak (Panga Mountain, 6967 feet) near its eastern edge. On the western side of the continent, between the Kalahari-Ngami Basin and the Atlantic coast, is the plateau of German Southwest Africa, covering Damara and Great Namaland. This plateau rises to somewhat lesser single heights than does the plateau of British South Africa: Karas (6570 feet), Awas (6988 feet), and Omatoka (8972 feet). Northward of all these, and extending from west to east through Angola and British Central Africa to the vicinity of lakes Nyassa and Tanganyika, where it joins the great eastern highland, is a broad plateau 750 miles wide from north to south and 1500 miles from west to east, with a general elevation of 3000 to 6000 feet. This forms the divide between the Ngami and Zambezi basins on the south and the Congo waters on the north, and has its highest points on the west end in the plateau of Bihe (Lovili Mountains, 7800 feet), and at the eastern end in the plateau mountain of Chitane (6500 feet) near Nyassa Lake. Toward the south it slopes gradually to the Ngami and Zambezi basins, and toward the north it falls more abruptly to the Congo region. Near the eastern end are two lakes, Moero or Meru (3188 feet) and Bangweolo (3700 feet), that drain into the Upper Congo River.

Stretching northward from the Zambezi River to the Red Sea is that great eastern highland which attains its most extensive development just south of the equator in the region about the Victoria Nyanza. Through a large part of its extent this highland maintains an elevation of over 5000 feet, which in Abyssinia rises over considerable areas to heights of 6000, 8000, and 10,000 feet. The main highland extends northward nearly to Suakin, and a narrow, interrupted spur reaches eastward from lakes Abba and Zuway to the apex of the Somali Peninsula, with peaks declining in height from Mount Mulata (9840 feet) to Godobb (4875 feet) at Cape Guardafui. The surface of this eastern highland is traversed longitudinally by a great system of so-called rift-valleys that constitute the most important feature of East African topography, and with which is associated a system of great lakes. These rift-valleys mark the course of parallel cracks in the earth's crust, between which the surface has sunk for thousands of feet, forming narrow, elongated depres-

sions, or broad cañons, with precipitous walls that rise to the broken edges of the high-level plateau. In these rift-valleys lie the majority of the great African lakes, most of which, consequently, are of elongated form. The longest of these rifts has its northern end in Palestine, in the Jordan and Dead Sea valleys; it forms the Red Sea Basin southward to the straits of Bab-el-Mandeb, where it is joined by a broader rift that comes from the east, forms the Gulf of Aden, and continues southwestward through French Somaliland and the Galla country into British East Africa to lakes Stephanie and Rudolf. At this point the rift-valley divides. One branch continues southward to beyond Lake Manyara, and another trends westward from Lake Rudolf to Lake Albert, and then southward to Lake Shirwa at the southern end of the eastern highland. In addition to these great rift-valleys there are many smaller fracture lines throughout the entire highlands that exercise considerable control over the smaller drainage features.

In the vicinity of the rifts are found the highest mountains, and in general the courses of the great rifts mark the location of volcanic peaks. The massive, snow-topped Ruwenzori range, with its culminating peak, Mount Stanley, rising to 16,800 feet, is among the most important of African mountain ranges, and it appears now to be entirely due to an uplift of a part of the Archæan floor of the continent. South of Lake Edward, on the eastern side of the western rift-valley, is a group of volcanic mountains, some of which are active, culminating in Mount Kirunga (11,194 feet). The most extensive volcanic district, however, lies along the eastern rift-valley and on the Abyssinian highland. Kilimanjaro (19,728 feet) and Kenia (17,191 feet), two isolated, snow-clad, volcanic peaks, rise from the eastern margin of this rift-valley near its southern termination. About the southern half of Lake Rudolf is a series of volcanic peaks, where several active cones rise 2000 feet above the plains, the best known of which is Teleki. Several very high mountains lie between Lake Rudolf and the Victoria Nyanza, the highest of which is Mount Elgon (14,206 feet). The Abyssinian highland is topped by massive fields of ancient lava, from which rise extinct volcanic peaks to heights of about 15,000 feet (Ras Dashan, etc.).

The great topographical feature of West Central Africa is the Congo Basin, surpassing in area the basin of the Mississippi by 175,000 square miles, and stretching from lat. 12° S. to lat. 8° N. and from long. 13° to 31° E. The whole of this area is an elevated plain, sloping gradually from all sides toward the middle west, where the vast outlet debouches, in lat. 6° S. It presents no elevated regions worthy of mention, except about the borders. The southeast watershed is not high, nor is that on the south, which separates the Congo waters from those flowing into Lake Ngami or collected by the Zambezi. North of Lake Tanganyika the high mountains form a lofty watershed between the northeastern sources of the Congo and the sources of the Nile. The basin of the Kotto River, a tributary of the Ubangi, supplies the most northern waters of the Congo system. The high ranges of Adamawa and the coast mountains separate the Congo's more westerly northern tributaries from the Ogowe and other coastal rivers. The mountains which separate the Congo

Basin from the coast are rather the broken eroded margin of the continental plateau than true mountains, and few if any peaks exceed 5000 feet in height.

The topographical division of Sudan covers the equatorial area between the watershed of the Congo and the Sahara Desert, from the head-waters of the Bahr-el-Ghazal, a tributary of the Nile, to the mountains of the coast—that is, the drainage basins of Lake Chad and of the Niger. The basin of Lake Chad is an inclosed area almost in the centre of the continent, its southern margin being removed but a few hundred miles from the head of the Gulf of Guinea. The lake itself has no outlet, and lies about 850 feet above the sea. The eastern border of this basin is separated from the Nile waters by a line of highlands which continue northward across the desert and which culminate in Darfur in the Jebel Marra, rising some 6000 feet above the sea and forming a watershed for eastern Sudan. The western border of the Chad Basin is formed by rocky plateaus, which constitute a divide between this and the Niger Basin; and a uniform plain, diversified by rocky hills, stretches westward to the coast mountains. Large portions of the Chad Basin are dry and open, while other extensive areas are forested or swampy, passing northward into desert. At the head of the Gulf of Guinea are high mountains culminating in Mount Kamerun, which rises to an altitude of 13,368 feet. Farther westward along the coast of Upper Guinea there are mountains, but of no great height, the supposed "Kong Range" of old geographies having been proved non-existent. The irregularly distributed heights in the hinterland of Sierra Leone, Liberia, and the Ivory Coast that mark the edge of the plateau and the descent to coastal plains do not exceed 3500 feet, except in the Peak of Kommono (4600 feet). The coast of Senegal is flat; that more southerly, except in Liberia, swampy; all the rivers, and especially the Niger, form extensive deltas.

The region of arid waste lands called the Sahara lies between the Sudan on the south and the Atlas Mountains and the Egyptian coast on the north. It is a part of an arid belt extending eastward to Baluchistan, the entire area measuring about 4,000,000 square miles. Of this area at least two-thirds lies west of Suez and is known in general as the Sahara. It is all an elevated plain, into which many valleys have been eroded by the ancient drainage systems which are now the most marked topographical features of the region. The whole area may, therefore, be divided into certain regions, limited by natural features. First, the so-called Arabian or Nubian Desert, the area between the Nile, the only living river that crosses the arid zone, and the Red Sea. This is marked in its southern portion by the continuation of the volcanic uplands of Abyssinia, which lessen in height toward the north, but border the Red Sea in a line of jagged mountains, many of which exceed 4000 feet, and one, Jebel Soturba, reaches 6900 feet. In the south is the great rift of the Wady Mahall, probably an ancient Nile channel; and in Lower Egypt are the rifts occupied by the Kharga, Dakhla, and others, forming a line of notable oases. West of the Nile rises the desolate plateau of the Libyan Desert, which covers the whole region from Central Darfur to the Mediterranean (long. 18° to 30° E.), excepting the few oases above mentioned. Its general

altitude varies from about 1500 feet in the south to 500 on the Mediterranean, where it breaks down in hills. A line of elevations extending northwestward from the Marra Mountains in Darfur to the Algerian Atlas forms a sort of boundary to the Libyan Desert and makes possible the thinly inhabited oasis regions of Tibesti and Murzuk. Farther west there are wadies, or dried-up river valleys, of which one, with numerous branches, is traceable from the Tropic of Cancer north to the "shots," or swampy lakes, which occupy the large, low plain (in places below sea-level) west of the Gulf of Gabes. It is believed that within 2500 years this valley was occupied by a flowing river, but now only a few pools and springs exist through the dry season. West of this more broken region between Algeria and Lake Chad there stretches an enormous space of waterless waste land, with shifting sand dunes, broken by lines of rugged and naked elevations having a general northeast and southwest direction. This waste extends to the Atlantic coast all the way from about lat. 18° to 28° N., that is, from the hills of Senegal to the western extremity of the Atlas. The elevation of the Sahara throughout the greater part of its extent exceeds 1000 feet, diminishing gradually from the south toward the north in the Libyan Desert, and from its centre in the western half of the desert toward the Lake Chad Basin and the Niger, and toward the coast of Tunis and Tripoli. Only very small and irregular areas along the northern border are below the level of the Mediterranean.

The elevated district called the Atlas Region, with its littoral margin along the Atlantic Ocean and Mediterranean Sea, is a part of the great Alpine system of Europe, to which it is linked by the mountains of Spain and the Pyrenees. Unlike other African mountains, the Atlas have a folded structure and an Alpine character, and present many parallel zones. These ranges extend in a nearly straight line from Cape Nun, on the Atlantic, northeast to the headlands of Tunis, where they are broken through by the narrows of the Mediterranean. Along the Mediterranean coast the elevations are volcanic and descend very abruptly. Toward the interior, irregular ranges form a long line of heights of Paleozoic rocks, which is sometimes called the Tell Atlas; but this is more prominent in Algeria than in Morocco, where the seaward side is a rough plateau. The Atlas stretches over a distance of about 1400 miles and attains its greatest elevation in the western portion, where it rises to a height of nearly 15,000 feet.

Geology. The geological structure of Africa, in its broad features, may be said to exhibit great simplicity and uniformity. The entire lower limb, with the Sudan and the western portion of the Sahara Desert, has a basal complex of crystalline rocks supporting sediments of Paleozoic and Mesozoic age. Strata of more recent deposition, with but one exception (Lower Egypt), occur only along the sea coast and the rivers. The greater part of the land surface, therefore, was formed in early geological times and has remained above sea-level during succeeding periods. Owing to this uniformity, Africa cannot be divided upon a strictly geological basis into more or less distinct units; such a division, however, has been made from a combined geological and geographical standpoint, separating the entire area into three provinces. The first of these comprises South

Africa, Madagascar, and a large portion of Central Africa, which in late Carboniferous time was united with India by an easterly land extension through the area now occupied by the Indian Ocean; the second includes the Sahara Desert and Egypt and is a continuation of Arabia and Syria; the third comprises the Atlas Mountains and is really a part of the Eurasian continent and of the great system of upheaval that is represented in Europe by the Alps and the Apennines.

The most ancient rocks found in South Africa are granites, gneisses, and schists, which lie below all fossil-bearing rocks and may therefore be classed as Archæan. Above these are tilted and eroded beds of sandstones and slates, which form the rampart along the southern extremities of Cape Colony and extend around to the west and north, spreading out over large areas in Namaqualand, Griqualand, Rhodesia, and regions to the north, and which have special economical importance, as they include within their limits the rich gold deposits of the Transvaal. These rocks are mostly of Paleozoic age. Higher up in the series are the Kimberley shales and the Karoo formation of sandstones and slates, which attain great development in British South Africa. Immensely thick deposits of this sedimentary material were laid down on the floors of the vast lakes that then extended through South Africa and the Congo Basin. No remains of a sea fauna have been found in the Karoo beds, but they are rich in amphibian and reptilian fossils that bear a striking similarity to the Triassic (Gondwana) life-forms of India, and also to those of Australia. They were probably deposited during the Permian and Triassic periods. Underlying them unconformably in places are the Dwyka conglomerate, a peculiar rock that often has the appearance of a volcanic breccia, and the Ecca mudstones and sandstones, constituting a group some 4000 feet in thickness. Volcanic rocks are represented by diabase and basalt, which are spread out over the surface in large sheets, being especially prominent along the eastern edge of the Drakensberg Mountains in the Transvaal. The diamond mines of South Africa are located in the vents of old volcanoes through which a basic rock (peridotite) was erupted. On the other edge of the plateau, along the sea coast, are small detached areas of sediments, more recent in origin than the foregoing.

Livingstone mentioned the presence of sandstones and coal seams along the Zambezi River (lat. 16° 40' to 15° 50' S.), and somewhat farther south crystalline rocks of Archæan type appear, as also along the shores of Lake Nyassa. The Rovuma River flows for a considerable distance (about lat. 11° S.) over sandstone beds that rest upon granite. The sandstones are found as high as 2500 feet above sea-level and extend from near the coast to long. 39° E. North of the Rovuma River sandstone strata, possibly of Carboniferous age, are developed on a large scale along two general lines—one extending northwest beyond the shores of Lake Tanganyika and the other extending north to near the equator. Between the diverging areas of sandstone crystalline rocks predominate, inclosing Lake Victoria Nyanza and reaching northward nearly to Lado on the Nile. They have been broken through and are overlaid by volcanic rocks, especially around Lake Rudolf, where volcanoes are still in eruption, and in

the region east of Victoria Nyanza, where there are many inactive cones. Volcanic action has been accompanied here by great vertical displacements, to which allusion has already been made. (See also article on GREAT RIFT-VALLEY.) The west side of Central Africa, from the Kunene River to the Gulf of Guinea, appears to be similar in structure to that of the eastern coast. On the shores of Angola there is a narrow fringe of Cretaceous sandstones, and in the interior crystalline rocks, mostly granite and gneiss, and fossiliferous sandstones of undetermined age predominate. These formations extend into the interior toward the Congo Basin, and they may reach also northward into the Sudan. In the Congo Basin there comes into prominence a peculiar superficial deposit called "laterite," which also covers wide areas in Sudan and the Sahara Desert. It is a porous yellow or reddish rock, formed by the disintegration and weathering of the underlying strata.

The plateau of Abyssinia has been found to consist of gneisses and granites as a basal formation, with overlying sandstone strata in nearly horizontal position. This region is especially characterized by the enormous development of volcanic rocks, which at different times have spread out over the surface. Westward, between Khartum and Fashoda on the Nile, there is a large area of Paleozoic sediments, extending on the eastern Nile bank as far south as Lado, where it sweeps around to the west. In Central Sudan crystalline rocks have been found along the Benue River and in the region between this river and the Niger. In the extreme western Sudan sedimentary strata with Devonian and Carboniferous fossils prevail; they are also developed to a lesser extent on the Gold Coast, where they overlie gneisses and schists. The interior of Liberia and Sierra Leone is supposed to be composed largely of crystalline rocks. The Sahara Desert presents a monotonous stretch of horizontal eroded beds of Paleozoic age resting upon eruptives and gneisses. After Carboniferous times, the whole Sahara region appears to have been elevated above sea-level and to have maintained this position until the beginning of the Cretaceous, when there was a subsidence, and the eastern part of the Sahara, including Egypt, was formed. Volcanic rocks are found in certain parts of the interior, but they are relatively unimportant. In Lower Egypt the ridge that forms the western border of the great rift or fault of the Red Sea is made up of gneisses, granites, and basic igneous rocks, with a sedimentary cap called the "Nubian" sandstone. The last-named constitutes the banks of the Nile at Assuan and also extends for a considerable distance into the desert region. To the north the Nubian sandstone is succeeded by Cretaceous and Tertiary limestones.

The Atlas region of Morocco, Algeria, and Tunis offers a striking contrast to the remainder of Africa, in that it is the only present representative of a mountain system formed by crustal folding. It is composed of eruptives, including trachyte and basalt, along the northern edge, with interfoliated gneisses, schists, granite, limestone, and sediments of Carboniferous, Jurassic, and Triassic age. Suess divides the region into parallel zones; the first is composed of volcanic rocks on the coast; the second consists of granite, gneiss, and schist; the third is a belt of sandstone and limestone, reaching southward into the Sahara Desert.

The continental islands, including the Canary, Madeira, and Cape Verde groups, and many isolated islands, are mostly of volcanic origin. Madagascar, however, is an exception and represents the remnant of a larger area that once extended from southern Africa to lower India. The central part of Madagascar is made up of granites and gneisses similar in character to those found on the mainland, while the western shore is formed by Jurassic and Tertiary sediments. See also articles on countries of Africa.

Hydrography. The great river systems of Africa, excepting the Niger, have their sources in the mountains of the south and southeastern parts. At the Gulf of Suez a line of highlands crosses to Africa from Syria, which follows the coast line of the Red Sea to its southern extremity, then bends to the south and southwest, passes the equator, and joins the broad plateaus that extend over South Africa. As there is no prominent interior mountain range, this long line of coastal highlands forms the most important water-parting of the continent. Within its bounds are the upper courses of the Nile, Congo, and Zambezi, as well as of the Orange and of most of the smaller streams. The Nile, Niger, and Congo rivers have their origin on the interior slopes of the highlands, and therefore discharge into the Atlantic Ocean, while the Zambezi drainage basin, lying largely on the outer slopes, falls off toward the Indian Ocean. The longest river system is that of the Nile, whose head stream is the Kagera River rising on the plateau of Ruanda to the east of Lake Kivu and west of Victoria Nyanza. After issuing from that lake on the Nile proper, the river flows northward through the mountainous divide to the plateau region of eastern Sudan, where it receives an important affluent from the west in the Bahr-el-Ghazal, and is joined farther north by the Sobat, the Bahr-el-Azrek (Blue Nile), and the Atbara, all from the plateau of Abyssinia. In the northern third of its course the Nile practically completes its vertical descent by numerous cataracts, after which it flows through a valley that is but little above the level of the sea. The drainage basin of the Nile includes an area of about 1,600,000 square miles. Next to the Nile in length and superior to it and to all other rivers of the world excepting the Amazon in volume is the Congo, which rises in the headwaters of the Lualaba tributary near the boundary between the Belgian Congo and Rhodesia and drains an area estimated at 1,170,000 square miles. The Congo flows a little west of north, then describes a great arc, with its chord formed by the equator, and finally turns southwest, and pierces the coastal barrier of Lower Guinea to enter the Atlantic. The tributaries of the Congo include many great rivers, such as the Ubangi, Kassai, Kuango, Sanga, and Aruwimi. The Lukuga River drains Lake Tanganyika to the Congo; and the Malagarasi tributary of the lake extends a narrow wedge of the Congo basin to within 500 miles of the Indian Ocean. South of the Congo are the drainage basins of the Zambezi and Orange rivers, which extend nearly across the lower limb of the continent and have an eastward and westward slope respectively. The great land-mass composing the western limb of the continent is poorly watered, the Niger being the only river of first importance lying wholly within the area. This river drains the northern slopes of the coastal highlands of Guinea, through which it breaks

after being joined by an important tributary from the east, the Benue, and enters the Gulf of Guinea. Of lesser rivers may be mentioned the Limpopo, Rovuma, Sabi, Tana, and Jub, which enter the Indian Ocean, and the Kunene, Kuanza, Ogowe, Volta, Gambia, Senegal, and Draa on the western coast. Owing to the mountainous barrier through which they must pierce to reach the sea, the smaller rivers of Africa generally are unnavigable in their lower courses.

Between the drainage basins of the Nile, Niger, and Congo, and west of the north and south range of highlands of Sudan, is the interior basin of Lake Chad. This lake is fed chiefly by the Shari and Waube, and is subject to great variations of level. It is a shallow body of fresh water, varying in area from 10,000 to 20,000 square miles, according to the amount of its water receipts. In 1902 it was at a low stage and had for years been decreasing in size. In 1911-12 it was again slowly enlarging. This phenomenon of sudden variations in level and consequently in area is peculiar to all the rivers and lakes of Africa within the equatorial regions and is due to the seasonal distribution of rainfall. Between Abyssinia and the Zambezi River and within the bounds of the north and south highland region there is another inland drainage basin with several large lakes, which together constitute one of the most striking physiographical features of Africa. The lakes lie along a line of rifts or fissures which have been formed by sudden displacements of the earth's crust. Some of the lakes are, Margherita, Abaya, Stephanie (in 1912 completely dried up), Rudolf, Manyara, Natron, Baringo, Eyassi, and Leopold (Rikwa), all but Rudolf being small bodies of water. Lakes Victoria, Albert, Albert Edward, Kivu, Tanganyika, and Nyassa drain into the Nile, the Congo, or the Zambezi, and are fresh water bodies. Victoria, Tanganyika, and Nyassa rival in extent the great lakes of North America. For further details, see articles on CONGO; VICTORIA NYANZA, etc.

Climate. Of all the great land divisions of the globe, Africa is characterized by the greatest uniformity of climate. It stretches into both the north temperate and south temperate zones, but the greater part of its area is included within the tropics; there is consequently a successive decrease of average annual heat northward and southward of the equatorial belt, but the regularity of the decrease is modified by certain other factors, so that the region of greatest average heat for the year is located not at the equator but considerably north of it, between the parallels of 10° and 20°. These modifying factors are mainly the direction of the winds and the distribution of the mountains. It is, of course, cooler here in certain seasons than in others; but the average temperature of any given season shows little fluctuation. In summer the isotherm of 80° F. incloses the whole of the Sahara Desert, and over a considerable portion of this area the average summer temperature is 97° or more. This region of extreme heat, which is the largest in the world, may be delimited by a line drawn from Khartum west to Timbuktu, thence north to El-Golea in the Algerian Sahara, thence southeast to Murzuk and thence to Berber on the Nile. The mountain regions of Algeria and Morocco and parts of British South Africa and of German Southwest Africa have a subtropical or temperate climate. Throughout a large portion of Africa, especially

in the mountains of the east and in the Sahara and Kalahari deserts, the temperature varies widely between summer and winter and between day and night, as is characteristic of all desert regions. (See DESERT.) In the Kalahari Desert the extreme seasonal fluctuation reaches 113° , and in the Sahara Desert the temperature during the night often approaches the freezing point. In general, the western coast of Africa is cooler than the eastern coast, owing to the conditions heretofore stated and to the influence of the drift northward along that coast (south of the equator) of the cool water from the Antarctic Ocean. (See article on CLIMATE.) *Winds.*—Trade winds are characteristic of nearly the whole continent. The Sahara Desert is a region of high barometric pressure during the winter months, thus causing outward blowing winds, while in the summer season the pressure is lowered, and there is an indraught from the surrounding territory. In the western part of the Sahara Desert and Sudan, north and northeast winds prevail during the greater part of the year, alternating with northwest and west winds for a few months in winter. The eastern Sahara region and Egypt have prevailing north and northeast winds. A devastating wind called the "khamsin" blows from the southeast across this region at times, carrying dust and sand and causing sudden rises of temperature. A similar dust wind, but usually cooler, blows from the interior of the Sahara over Senegambia and Upper Guinea and is called the "harmattan." During the summer, in the lower limb of Africa, an area of low pressure occurs in the interior, and the prevailing winds are from the east and southeast on the eastern border, and south and southwest on the western. In winter there is a shorter period in which the winds blow outwardly. (See article on WIND.) *Rainfall.*—The principal factors governing rainfall are evaporation, direction of winds, and distribution of mountains. A combination of these factors most favorable to a large rainfall is found on the west coast of Africa near the equator. Here the humid atmosphere from the Atlantic is carried landward by the winds and, becoming cooler, deposits the greater part of its moisture before passing the highland region. The maximum limit of precipitation is probably attained in Kamerun, where the total rainfall in the year may exceed 350 inches, while the Niger Delta and the coasts of Sierra Leone and Liberia also are excessively humid. On the east equatorial coast the winds from the Indian Ocean deliver considerable moisture, but not in such abundance as on the west coast. As they pass into the interior, the winds from both the Atlantic and Indian oceans are deprived of their humidity, especially in the mountains, which act as precipitating agents. Equatorial Africa, as a whole, is thus characterized by a heavy rainfall. North and south of this region, however, the conditions exhibit a striking contrast. In the north is the Sahara Desert, the largest arid region in the world, where the prevailing winds are from the northeast and are hot and dry, while the humidity of the southerly winds that may penetrate into the interior is diminished by the heat and seldom falls as rain. A second arid region, the Kalahari Desert, is found in the southern limb of the continent, between the Zambezi and Orange rivers and the eastern and western coastal highlands. It has a small spasmodic rainfall, which is usually insufficient to support

a constant growth of vegetation. The Mediterranean coast region and the extreme southern extension have a dry climate that is tempered by rains during certain seasons. Besides the continental distribution of rainfall, there is a seasonal variation in the amount received in different latitudes. In the regions near the equator rain may fall during every month of the year, but the periods of greatest precipitation occur when the sun is nearly vertical, in spring and fall. Away from the equator there is generally but one wet season. See articles on countries of Africa.

Flora. The vegetation of Africa is very diversified on account of the well-marked topographic districts and the varied climatic conditions. The three zones of tropical, north temperate, and south temperate climate have their peculiar types of vegetation, the distribution of which in each zone is determined by the immediate physiographic features. Forest, steppe, savanna, and desert floras are found in each zone. The flora of the Mediterranean slope of the northern temperate zone has a general resemblance to that of southern Europe, with forests of oak and of smaller trees, as olives and figs, with also the vine and the same cereal grains. The desert regions (typified by the Sahara in the north temperate zone and the Kalahari Desert in Bechuanaland of the south temperate zone) support a scant xerophytic vegetation, which, contrasted with the flora of the North American deserts, has for its most prominent types quite leafless, thorny and fleshy euphorbias and acacias instead of cactuses. In the Sahara Desert the date palm grows often in extensive groves in the oases, and its wide distribution is probably due in large part to the dispersion of its seeds by the nomadic tribes, for whom its fruit serves as an important article of food. Bordering the Sahara and the Kalahari deserts are extensive semi-arid steppe or prairie regions, where the slight rainfall permits of the existence of a somewhat more varied flora, which combines certain of the desert and forest types. The steppe region of the southern temperate zone has, by reason of its isolation, developed a flora peculiarly its own, which is characterized both by the abundant presence of many members of the heath family (which often grow to a height exceeding 10 feet) and also by the general brilliancy of color of the flowering plants.

Those portions of Africa which have a moist climate are divisible into the savanna and forest regions. The forests are found mostly in the equatorial districts, where they are of enormous extent. Here the trees grow to great heights (often 200 feet) and, being close together, support numbers of parasitic vines, forming over vast areas a dense, tangled covering of foliage, through which the direct rays of the sun seldom penetrate. The savanna districts are uniform plains of both high and low land. On the damp lowlands, reeds, especially the papyrus, abound (as, for example, in the marshy regions of the Nile and Congo valleys); on the drier high grounds good pasture grass with euphorbias forms the dominant vegetation, together with forest growths in the river valleys. The more important trees are the baobab (*Adansonia*) and the wine and oil palms (*Raphia* and *Elæis*). In conclusion, it may be stated that the flora of Africa is characterized by the extensive development of acacias and euphorbias over the

entire continent, with the date palm in the northern (particularly in the arid) regions, and the papyrus in the marshes. See DISTRIBUTION OF PLANTS.

Fauna. The fauna of Africa is remarkable for its homogeneity, for the continental range of a great number of its groups and species, due to the absence of extensive mountain barriers, and for its remarkable alliance with the fauna of the other divisions of the southern hemisphere. Africa—apart from the northwestern corner (the Atlas Mountains, in which live the aoudad and certain other European forms)—is now regarded as forming, together with Arabia and Palestine, a single zoögeographical prime division called Ethiopian. Surveying its principal groups of animals, it is seen to be characterized in respect to the mammals by the preponderance of hoofed animals and the great size of many, such as the elephant, hippopotamus, and rhinoceros, by the originally vast numbers of gregarious grazers, and by their distinctive forms. Thus, there are no true oxen, but a buffalo is abundant; no camels nor llamas; no sheep nor goats; no deer (except the aberrant chevrotain) nor true swine. But it has exclusively several species of the horse family, the zebra, quagga, and wild ass; a giraffe, once ranging all the southern plains, and the okapi (q.v.); the tribe of hyraxes, and almost 100 kinds of antelopes and gazelles, few of which range outside of Africa and Arabia. Of apes, the chimpanzee and gorilla belong to the equatorial forests alone; but more widely distributed, though exclusively African, are the baboons, various kinds of monkeys, and nearly all the lemuroids. Among the carnivora, bears, wolves, and foxes are wholly absent, and several feline, viverrine, and canine forms are peculiar, although the characteristic lion and leopard are not restricted to Africa. The lesser mammals are mainly the same as or allied to southern Asiatic and Oriental forms. Resident birds display similar unlikeness to Europe and Asia, and suggestive resemblances to those of the Australian and Neotropical regions. Thus, the ostrich, so widespread and characteristic of Africa, is unknown elsewhere, but its allies are the extinct and modern ratite birds of the Australasian archipelago and the rheas of Argentina. Africa is rich in reptiles, but few are peculiar, chiefly terrestrial venomous snakes and the chamasaurid lizards; and the affinities of this group, as of the fishes, are Oriental, though some of the fishes are remarkably related to ancient American families. Similar remarks apply to the invertebrates, where many genera even are the same as those of either Australia, the Malayan region, or America. For particulars as to the various faunal sub-regions, Madagascar, West-coast, etc., see DISTRIBUTION OF ANIMALS.

Population. Recent authorities roughly estimate the population of Africa at about 140,000,000, or 12.4 to the square mile—a density slight when compared with that of Europe, but much greater than that of the American continent. According to the nature of the soil and of the climate, the population is distributed very unevenly over the surface, being very dense in the Nile delta and massed somewhat densely in the Upper Nile valley, and generally throughout the Sudan, less thickly over the southern plateau, and very thinly in the outlying regions of Morocco and Tripoli; while large tracts, especially

in the western Sahara and in the Libyan and Kalahari wastes, are absolutely uninhabited. Of the inhabitants of Africa, only a small portion are recent immigrants from Europe, settled chiefly in the extreme north (Algeria) and in the extreme south (Union of South Africa).

Ethnology. The yellow, the brown, and the red varieties of the human genus have no representatives in Africa, with the exception of some of the Polynesian tribes in Madagascar and the intrusions of eastern Asiatics in recent times. The 140,000,000 inhabitants of the continent represent the white and the black varieties of man, or mixtures of these. Northern and northeastern Africa have been occupied in historic times by white races, while equatorial and southern Africa were the home of black races; but the white Africans have from remote antiquity forced themselves into the black man's territory, and negro blood has mixed with that of Hamite and Semite across the Sahara; hence, especially on the border line, the ethnic stocks are intermingled.

Various schemes of classification have been proposed for the people of Africa, one of the best-known being that by Deniker. Deniker's scheme (*Races of Man: an Outline of Anthropology and Ethnology*, London, 1900) is as follows:

I. Arabo-Berbers, or Semito-Hamites — (1) Jjerba subrace; (2) Elles type; (3) Dolichocephalic Berber subrace; (4) Jerid or Oasis type.

II. Ethiopians, or Kushito-Hamites, sometimes called Nuba, or Nubians.

III. Fulah-Zandeh group. Mixture of Ethiopians and Nigritians or Sudanese Negroes.

IV. Nigritians—(1) eastern Sudan, or Nilotic Negroes; (2) Nigritians of central Sudan; (3) Nigritians of western Sudan and Senegal—Hausas, Mandes or Mandingans, Toucouleurs or Torodos, Yolofs of Senegal; (4) Littoral Nigritians or Guineans—Krus, Agnis, Tshis, Ewes; (5) Yorubas.

V. Negrillos.

VI. Bantus. In central and southern Africa, divided into western, eastern, and southern Bantus.

VII. Bushmen-Hottentots.

VIII. Hovas, Malagasies, and Sakalavas of Madagascar.

This classification is not altogether based on physical difference, for the term "Bantu" has a purely linguistic significance. Thus, some Pygmy tribes, at least, speak Bantu dialects, though their physical type differs widely from that of their taller Bantu-speaking neighbors, and the same applies to some of the East African peoples whose appearance suggests a mixture of Negro and Asiatic blood. Disregarding relatively recent immigrants into the continent and also tribes of obviously mixed blood, we may distinguish the following racial types: (1) Pygmies, now scattered in small groups over the Congo and neighboring areas; (2) Bushmen, sometimes classed with the Pygmies, but hardly on quite convincing grounds; (3) Hottentots; (4) Negroes. The last-mentioned are often subdivided into Sudanese and Bantu Negroes, but, as already stated, this is not a racial but a linguistic distinction. The Pygmies and Bushmen are commonly assumed to have been the oldest aborigines of Africa and to have been pushed back into more and more undesirable habitats by stronger immigrant peoples.

The northern Africans are Hamitic, and were

DARK RACES OF AFRICA



BUSHMAN TYPE SOUTH AFRICA



HOTTENTOT TYPE SOUTH AFRICA



CONGO TYPE



ZULU TYPE SOUTH AFRICA



GUINEA TYPE



ZANZIBAR TYPE EAST AFRICA

preceded (1) by Stone Age peoples; (2) by the kindred of Iberians, Silurians, and other tribes of southern and western Europe. The monolith builders apparently merged into the Berber Hamite intruders, who, in turn, were encroached upon by Phœnician Semites; then followed Romans and Teutonic Vandals, though the chief ethnic element continued Berber until the coming of the Arabs (100–200 A.D.) and the irruption of the Moslems (from 639 A.D.). The Arabs are now in the ascendancy, but the Hamitic tribes continue in the uplands (Keane, 1895).

There are among the African peoples examples of the lightest and the darkest races. There are also examples of the smallest and the largest of mankind, as the measurements in metric standard from Deniker will show: Akka, 1.378 meters; Bushmen of Kalahari, 1.529; Mzabite Berber, 1.620; Batekes of the Congo, 1.641; Algerian Arabs, 1.656; Danakils, 1.670; Kabyles, 1.677; Bechuanas, 1.684; Mandingo, 1.700; Kaffirs, 1.715; Somali, 1.723; Wolof, 1.730 (many are over 6 feet); Fulah, 1.741. The Wahuma of Ruanda, East Africa, average not less than 1.80 and are probably the tallest people in the world; statures of 2 meters (over 6 feet 6 inches) are said to be relatively common among them. Compare with these the Aeta of the Philippines, 1.465; Eskimo, 1.575; Lapps, 1.529; Cheyennes, 1.745; Sikhs, 1.709, and Marquesas Islanders, 1.743. The range of cranial index is quite as wide. Among the Congo tribes the index is 72°.5, the Fijuan Negroes have an index of 67°.2; the Sara of the Chad Basin have an index of 82°.41, but many peoples in Oceanica, America, Asia, and Europe range between this ratio and 88°.7.

The development of the native African cultures forms one of the most fascinating problems for the ethnologist because of their established or suggested relationship with the cultures of other areas. In the north and east, Asiatic influences have demonstrably been at work. Ruins discovered in Rhodesia have suggested to some scholars the theory of an ancient migration from southern Arabia, but latterly these structures are believed to be of mediæval origin and to have been reared by Bantu Negroes (see Randall Maciver, *Mediæval Rhodesia*). Quite recently Frobenius has advanced the hypothesis that the older civilization of Yorubaland on the west coast was imported ready-made from ancient Etruria. The art of smelting iron is supposed by Foy and others to have been brought in from Asia, while Von Luschan argues for an African origin of metallurgy. Frobenius and Graebner note a number of really striking resemblances between Negro and Oceanian culture and regard the former as in large measure derived from the latter.

While many of the questions just raised have not been definitely decided, it is clear that the theory of extraneous influences has been considerably overdone. Negro culture, to which that theory is largely confined, bears many characteristic features that indicate independent origin, or at least independent remodeling of imported elements. Moreover, archæological finds within the last 10 or 15 years establish the existence of a stone age over the greater part of Africa and thus suggest a probable beginning for the observed Negro cultures on African soil. It is interesting to note in this connection that there is no evidence for an African copper or bronze age, the natives having apparently taken the

step directly from stone to iron implements (granting that the iron technique is of African origin; see above).

A few essential traits of African culture may now be noted. Economically, the three principal modes of securing food are all represented. The Bushmen and Pygmies are hunters and gatherers of wild roots and small animals; the Hottentots and a number of East African tribes, such as the Wahuma and Masai, are primarily herdsmen and in a subordinate way hunters; all the Bantu (with the exception of the Herero) and the Sudanese Negroes are, above all, tillers of the soil, though cattle-raising looms large among the Kaffir and a number of other peoples. Apart from the Bushmen, Pygmies, and Hottentots, the industrial life of the Africans has for its most distinctive feature the practice of the blacksmith's art, for while pottery, weaving, and basketry are extensively cultivated, they are not peculiar to the Negroes as compared with the natives of other continents. Politically the Negroes show a striking tendency towards the formation of powerful monarchies under the sway of absolute despots—a tendency that is strongly contrasted to the essentially democratic spirit displayed by the North and South American Indians. The social organization of relatively few tribes has been determined, so that it is not practicable to generalize on this subject. In many localities, however, a definite clan system has been noted with descent traced either on the father's or the mother's side. The social and political life is often dominated, especially on the west coast, by a secret society that terrorizes the uninitiated; this is one of the cultural elements that lend some support to the theory of Oceanic influence (see above). The existence of markets for the intertribal exchange of goods is highly characteristic of a large part of Africa, as is also the adjudication of legal cases by an ordeal to which the accused is obliged to submit. In the discussion of African native religions such little-understood catchwords as "fetichism" have generally taken the place of sound information. According to recent publications by Pechuel-Loesche and the Congo Museum at Tervueren, Belgium, fetichism, which is especially well developed along the west coast and its hinterland, is at bottom not very different from the manitou beliefs of the American Indians. The carving of a human image, which is usually emphasized in popular accounts, is really unessential; a leaf, or some other inconspicuous natural object, may become a fetich provided it has exerted a peculiar psychological effect on the beholder. What is important is that the object, whether natural or artificial, should be endowed with mysterious qualities by means of magical rites and substances. Amulets, whether produced in this or other ways, are used extensively all over the continent. In some regions, e.g., Yorubaland, divination by the casting of lots, plays a very important part. The Yoruba also worship a very large number of deities, each presiding over some definite department of nature or human activity. What corresponds in Africa to the literature of written languages takes the form of mythic tales about the gods, and more particularly that of animal fables and proverbs, the latter often revealing great shrewdness in the affairs of every-day life.

On the whole, then, the African native cultures must not be underestimated. In many directions, e.g., political organization and cer-

tain forms of artistic endeavor, the Negroes have achieved very creditable results, and if Von Luschan's theory should hold they would have to be honored as the originators of the iron technique.

Religions. Fifty-eight per cent of the population, according to the estimate of H. P. Beach, are devotees of the native religions, which are characterized by features noted in the preceding section.

Imported Religions.—(1) Mohammedanism. Of the religions imported into the continent, by far the most important is Mohammedanism, the faith of 36 per cent of the population. It came thither in the seventh century and overran all North Africa in a hundred years, so completely overturning the Christian churches which had been planted there that they have never been revived. Mohammedanism retains its conquests in Egypt, Barca, Tripoli, Algeria, and Morocco, and it is to-day one of the greatest missionary religions. It presents a one-sentence creed, "There is but one God and Mohammed is his prophet," and has the simplest methods. The missionary is unpaid and usually a native. There are no mission boards, or expenses for salaries and printing. There is usually no special training, although in Cairo there is a Mohammedan university, attended by thousands of students, and from this many of the missionaries go forth. They have been remarkably successful in spreading their faith among heathen populations in Central Africa. In this way Mohammedanism has exerted an influence which counteracts the native religions and so improves the condition of the peoples it reaches. (2) Christianity; (a) Copts, the descendants of those original Christians who in the fifth century adopted the theory that in Jesus the human and divine make one composite nature (monophysitism) and so are reckoned among Christian heretics. They are found in Egypt and number about three-quarters of a million. (b) Abyssinian Christians, who trace their faith back to the Coptic missionaries of the fourth century, but present a curious mixture of Christianity and Judaism. (c) Roman Catholics. The first missionaries of this faith to penetrate the Dark Continent were Jesuits, and they began work in the middle of the sixteenth century. Indeed St. Francis Xavier came to Mozambique as early as 1541, but he did not stay more than six months. The result of the work, carried on continuously ever since, has been that now $1\frac{2}{5}$ per cent of the population are Roman Catholics, living in all parts of the continent. Livingstone bore testimony to the value of the work of these missionaries. (d) Protestants. The first who came to Africa were Moravians. This was in 1792. Since then all branches of Protestantism have labored there, and their converts now number $1\frac{9}{10}$ per cent of the population, and they are found in every part. Roman Catholics and Protestants, especially the latter, carry on missionary work among the Coptic and Abyssinian Christians. South Africa is to a considerable extent a Christian country of the modern civilized type. (3) Judaism. About $\frac{3}{10}$ of 1 per cent of the population of Africa are Jews.

Social Conditions. Slavery is still "the open sore of Africa," as Livingstone said, and nowhere is it more cruel, bloodthirsty, and destructive. The ivory trade is a constant source of trouble, setting tribe against tribe in war. Polygamy is widespread. The tribal government,

the absence of central authority, the usual conditions of savage life, in bondage of superstition and terrors of every kind—these disturb life over great stretches of territory. Yet it is the testimony of travelers that peace and a certain kind of prosperity are found in many villages in the very heart of the land. Consult: F. P. Noble, *The Redemption of Africa* (2 vols., New York, 1899); A. P. Atterbury, *Islam in Africa* (New York, 1899); H. P. Beach, *Geography of Protestant Missions* (New York, 1901).

Early History and Exploration. In the earliest historic times, when civilization centred around the Mediterranean, Libya, as Africa was known to the ancients, was one of the three great divisions of the earth, of which Europe and Asia were the other two. The details of its history are to be found in the history of Egypt, still the earliest recorded civilization, and of the other States of northern Africa, as well as of the Roman Empire, which absorbed them all. The brown-hued Berbers seem to have been the fundamental race stock throughout northern Africa, with perhaps Aryan and Semitic infusions, due to the contact of Egypt with Asia and Europe. Whether the Hamitic peoples of Africa were or were not autochthonous is a problem for the settlement of which no sufficient data exist. The knowledge possessed by the ancients of the continent as a whole, so far as we have accounts of it, can be briefly stated. The rulers of Egypt, as subsequently those of Carthage, attempted to extend their influence toward the south and west; but the physical and climatic conditions and the savage tribes encountered presented an effective bar to extended progress at that time. An inscription assigned to the period of the Eleventh (Theban) Dynasty tells of a voyage made by command of one of the rulers of that dynasty to the land of Punt, probably Somaliland. Recent discoveries also seem to increase the credibility of traditions which assigned the biblical lands of Ophir to the eastern coast of Africa. About 30 centuries ago the enterprising Phœnicians planted Utica (c.1100 B.C.), Carthage (826 B.C.), and other lesser colonies along the Mediterranean coast, and Greek colonies were founded in Egypt, in Cyrenaica, and just east of Carthage, during the period of Greek colonization, which began in the seventh century B.C.

The known explorations of the Dark Continent may be said to begin with the famous voyage made by Phœnicians about 600 B.C., an account of which is preserved by Herodotus (iv, 42). There are no sufficient reasons for doubting the general accuracy of the account, which describes the voyage as made by command of Necho, King of Egypt, who had just completed a canal from the Nile to the Red Sea. The expedition sailed down the Red Sea and along the coast of Africa, until the sun for many weeks "rose on their right hand." After a long absence the explorers returned to Egypt through the Pillars of Hercules, so that they must have circumnavigated the continent. A hundred years later, also according to Herodotus (iv, 43), a Persian of noble birth, Sataspes, started, with a Carthaginian crew, down the west coast of Africa, but was compelled to turn back. It is doubtful if he went far beyond the Phœnician settlements, which, beginning at Gades, just without the Pillars of Hercules, already extended well down the coast of Morocco, along which Hanno, about 480 B.C., planted a series of colonies. The "Islands of the Blessed" also (the Madeira and Canary Islands)

were probably within the scope of the sea-going trade of the Phœnicians and Carthaginians. Carthaginian traders trafficked by sea with the Gold Coast, and by land along the caravan routes which communicated with the flourishing regions of Upper Egypt and the Niger. It is probable that almost contemporaneously with the Phœnician settlements in northern Africa, Arabs entered the country south of the Zambezi and, going inland, found and worked the gold mines which have been recently rediscovered. The Greeks began to colonize northern Africa in the seventh century B.C. After the conquest and destruction of Carthage by Rome (146 B.C.), all northern Africa was gradually drawn into the growing Empire; but Rome's interest lay in the known and organized regions, upon which she strengthened the hold of civilization, ignoring all that lay beyond her well-defined boundaries, a policy which was accentuated as the Empire tended toward decay.

Christianity was introduced into Africa in the earliest days; the North African church was a recognized division of the Christian Church in the second century, and when a synod of this church was held in 258 it was attended by 87 bishops. Its chief city was Carthage. Three names in this church are prominent: Tertullian (third century), the first to employ the Latin language in the service of Christianity; Cyprian (third century), Bishop of Carthage, and one of the great ecclesiastics of the early Church; and Augustine (fifth century), Bishop of Hippo, the greatest of the Latin fathers. The earliest translation of the Bible into Latin was made in North Africa, and it was the battle-ground of the famous fights with heretics and schismatics, such as Donatists, Pelagians, and Montanists. But the church was destined to have a short life. Undermined by formalism and apathy, it fell beneath the Mohammedan onslaught in the seventh century. During the Germanic invasions the Vandals grasped the African provinces, and in the early mediæval period much that had been known to Ptolemy and the geographers who preceded him was forgotten. The maps of Ptolemy, representing the knowledge of the second Christian century, indicate the course and sources of the Nile and the mountains of west Central Africa more accurately than they were again shown on maps before the middle of the nineteenth century. What Europe was forgetting, the Arabs, in the advance of the Mohammedan power, rediscovered. From Arabia the new faith spread rapidly westward along the southern shores of the Mediterranean and inland across the desert. It took such deep root in northern Africa that the Christian religion, which in many places was then well established, has never been able to regain a real foothold among the native races.

Northern Africa became a battle-ground during the later Crusades and all the succeeding struggles on the Mediterranean between Cross and Crescent and was the scene of changes and strife among rival Mohammedan dynasties; but ignorance of the rest of the continent only deepened with the centuries, except among the Arabs, who occasionally pushed their expeditions southward. If traditions may be believed, Norman vessels from Dieppe visited the Gold Coast as early as 1364, and in 1413 the Normans built a fort at Elmina. There is neither inherent improbability in this story nor satisfactory evidence to prove it, but it is probable that Norman

voyagers found their way to the West African coast at a very early period. In 1402 Jean de Béthencourt sailed from La Rochelle and established a settlement on Lanzarote, one of the Canary Islands. During the next three years he extended his sway over the natives of the neighboring islands. Although his expedition is sometimes spoken of as the beginning of modern African discovery, the accounts of it show conclusively that the islands were already comparatively well known. Indeed, Béthencourt seems to have started with some sort of grant from the King of Castile. Long before, in 1344, the Pope had granted the islands to a scion of the royal house of Castile, Don Luis de la Cerda, who had taken the title of Prince of Fortune, i.e., of the Fortunate Islands. This same year, 1344, is given as the date for the discovery of Madeira. In that year, so the tale goes, a young Englishman, Robert Machin, eloped with Anne d'Arfet, or Dorset, a woman of noble birth, and sailed away with her for France, but contrary winds carried them to the island of Madeira. There the lovers died; but one of the company returned to Portugal, and the report of his adventures served to guide the captains of Prince Henry, who rediscovered the island in 1419.

The real opening of Africa to the knowledge of the modern world began with Prince Henry of Portugal (q.v.), called the Navigator. In 1415 he participated in the victorious campaign of Portugal against the Moorish citadel of Ceuta, and his interest was awakened by the enigma of the unknown continent. On his return he devoted himself to the task of sending expedition after expedition down the African coast to determine the extent of the continent and to find, if possible, a way to the east around it. These expeditions crept farther and farther southward. In 1434 Gil Eannes passed beyond Cape Bojador, the "bulging cape," off which the Atlantic currents ran so strong as to bar all previous attempts at progress. In 1441-42 Antão Gonçalves and Nuño Tristão passed Cape Blanco and reached the Rio d'Ouro, whence they brought back 10 negro slaves and some gold dust; and the demoralizing trade which was to characterize West Africa for nearly four centuries was fairly begun. In 1445 an exploring party started from the mouth of the Rio d'Ouro and spent seven months in the interior. In the same year Diniz Dias passed the mouth of the Senegal, discovered Cape Verde, and returned to Portugal with four negroes taken from their own country, previous importations having been secured by exchange with the Moors. The next year Nuño Tristão reached the Gambia, where he was killed, with most of his followers, by the natives. Ten years later, 1455 and 1456, Cada Mosto (q.v.) explored the river and discovered the Cape Verde Islands. In 1448 the Portuguese built a fort on the Bay of Arguin, south of Cape Blanco, and soon after formed a company for carrying on trade in slaves and gold with the Guinea Coast. The impulse given to exploration by Prince Henry continued after his death, which occurred in 1460. Pedro de Cintra, in 1462, added the coast as far as Sierra Leone and Cape Mesurado to the Portuguese claims. In 1471 Santarem and Escobar carried the Portuguese flag across the equator. Commerce, meanwhile, was familiarizing pilots and the makers of sailing charts with the details of the West African Coast. In 1482 Diogo Cão passed the Congo and heard from the natives tales which seemed to confirm the old

story of Prester John (q.v.), a Christian king ruling somewhere beyond the wall of Mohammedanism with which Europe was surrounded. It has been supposed by some that the King of Abyssinia was the subject of this legend. The Portuguese King determined to communicate with this unknown Christian brother, and in July, 1487, sent Bartholomeu Dias (q.v.) with two ships of some 50 tons and a smaller tender to carry his message. From the Congo, Dias beat down to Cape Voltas, near the mouth of the Orange River. Thence he was driven by storm southward for 13 days, after which he steered north and east in the hope of regaining land. He sighted the southern coast of Africa, near the Gouritz River, at Vleesch Bay. Keeping on toward the east, he landed on an island in Algoa Bay, still known as Santa Cruz, or St. Croix, from the cross which he set up there. When he reached the mouth of the Great Fish River, long the boundary of Cape Colony, the patience of his crews gave out, and they forced him to put about for home. On the return journey he sighted, first of modern sailors, the great landmark which has appropriated the generic name of The Cape. Dias christened it the Stormy Cape (Cabo Tormentosø), but on his return in December, 1488, the King (or, according to Christopher Columbus, Dias himself) gave it the more cheering name of the Cape of Good Hope.

While Dias was rounding the Cape, the King, fearing lest his vessels might fail to reach Prester John, sent another message to that potentate, overland, by Pedro de Covilhão and Alfonso de Payva. From Aden, in Arabia, Payva made his way to Abyssinia, where he was killed, while Covilhão went eastward to India. From Goa Covilhão sailed to Sofala, in eastern Africa, where he gathered news of Madagascar, and satisfied himself that it would be possible to go around to the western side of Africa by water. His report reached Portugal in 1490, but it was seven years before Vasco da Gama (q.v.) proved its correctness, in November, 1497. Starting from Lisbon, he doubled the Cape and, after encountering storm and tempest and the southern sweep of the Mozambique current, sighted, on Christmas Day, 1497, the land which still bears the name he gave it in honor of the day—Natal. After touching at Mozambique and Mombasa, he arrived on Easter at Melinda, where he found a pilot who took him across to India. The land was sighted on May 17, 1498, and three days later Da Gama anchored off Calicut.

Modern Exploration. Thus far the Portuguese had been almost alone in the exploration of Africa, but in the second half of the eighteenth century a new era of discovery began—an era in which men of several nationalities have had a share, and by the results of which several nations have sought to profit. The new line of explorers is headed by James Bruce (q.v.), a Scotchman who had been British consul at Algiers from 1763 to 1765. While in Egypt in 1768 he conceived the plan of seeking for the sources of the Nile. After crossing the Red Sea to Jiddah, he entered Abyssinia by the way of Massawa and proceeded to Gondar, where he won the favor of the negus. After some delay he succeeded in reaching the headwaters of the Blue Nile, and believed that he had found the true source of the main river. He arrived in Cairo in 1773. His account of his journey and the increasing interest in the slave traffic led to the organization, in 1788, of the African Associa-

tion, expressly intended to promote the exploration of the unknown parts of the continent. In 1795 the association dispatched Mungo Park (q.v.) a young Scotchman, to the mouth of the Gambia, to explore the interior and to find the Niger, on which was supposed to be the negro city of Timbuktu. Passing up the Gambia, Park, after many adventures, reached the Niger, which he traced for a considerable distance along its middle course. He returned to England, but again set forth in 1805, intending to travel overland to the Niger, and by sailing down that stream prove his theory that it was identical with the river which was known at the mouth as the Congo. He was drowned at Bussa, with one of his companions, and all the other members of the party succumbed to fever.

Meanwhile, the Portuguese Brazilian F. J. de Lacerda in 1797 started from the Zambezi to cross the continent from east to west, but died near Lake Moero. Other Portuguese explorers traversed this region from both sides during the next 35 years. The stories that Park had heard and published about the mysterious city of Timbuktu aroused great curiosity. The city was reached in 1811 by a British seaman named Adams, who had been wrecked on the Moorish coast and carried inland as a slave, but was ransomed by the British consul at Mogador. In 1822 Major Denham and Lieutenant Clapperton (q.v.) attempted the trans-Saharan route to Timbuktu. From Murzuk, the capital of Fezzan, they made their way to Lake Chad and thence to Bornu, adding, in a second trip by Clapperton from Benin to the Niger, some 2000 miles of route to the known geography of West Africa. In 1826 Timbuktu was reached by Major Laing (q.v.), who was murdered there. In 1828 René Caillié reached the far-famed metropolis, and his report aroused widespread interest, one sign of which was the prize poem with which Tennyson began his public career. The doubtful geographical problem of the course and mouth of the Niger was finally solved, 1830-34, by the Lander brothers. At this time the exploration of the Nile was carried on under the auspices of Mehemet Ali, its course being traced almost to the equator. In 1847 the German missionaries Krapf and Rebmann discovered the peaks of Kilimanjaro and Kenia.

The middle of the nineteenth century marked the introduction of the distinctly scientific spirit into African exploration. Heretofore the thirst for adventure, the desire to develop a profitable trade, and a somewhat sentimental humanitarianism had been the chief motives of the expeditions. The era of systematic scientific exploration was ushered in by Dr. Heinrich Barth (q.v.), a German in the English service. The primary object of his activity was the opening of trade with Central Africa. He left Tripoli early in 1850 with James Richardson, who died soon after leaving Bornu, where the party had separated. Overweg, another of the leaders, was the first European to sail on Lake Chad, and died in 1852. Barth, for four years, conducted extensive explorations in the heart of Africa. From Lake Chad he crossed Hausland to the Niger, thence across country to Timbuktu, thence back to Say on the Niger, to Sokoto, to Kukawa in Bornu, and across the desert to Tripoli, whence he returned to England with the most valuable contribution yet made to the geographical knowledge of interior Africa. His voluminous works are of the highest value. Before



Barth started from the north, another of the greatest of African explorers, David Livingstone (q.v.), had unostentatiously begun his remarkable career. He had settled in 1841 in Bechuanaland and, gradually pushing northward, discovered Lake Ngami in 1849. In 1851 he arrived at the Zambezi. He prepared himself thoroughly for more extended work and went to the Zambezi again in 1852, followed up the river almost to its source, crossed to Angola, and then returned and followed the Zambezi to its mouth. He went to London in 1856. Burton (q.v.) and Speke (q.v.) explored Somaliland in 1854 and in 1856 led an expedition under the auspices of the Royal Geographical Society, which discovered Tanganyika and the southern shore of Victoria Nyanza, which Speke and Grant explored from 1860 to 1864. Numerous Austrian, Italian, German, and English explorers had been working in the Nile region. Sir Samuel Baker explored the Abyssinian branches of the Nile, met Speke and Grant in 1864, and discovered the Albert Nyanza and its connection with the Nile. Livingstone, between 1858 and 1864, explored the river Shire and discovered Lake Nyassa. He renewed his work in 1866, going from the Rovuma River to Nyassa, Tanganyika, Moero, the Luapula River, and Bangweolo, where he arrived in 1868. Thence he went to Tanganyika and Nyangwe on the Upper Congo, which he called the Lualaba. At Ujiji a relief expedition sent by the New York *Herald* under H. M. Stanley (q.v.) met him in 1871. Livingstone soon returned to Lake Bangweolo, where he died in 1873. Another relief expedition sent out by the Royal Geographical Society in 1873 under Lieutenant Cameron, starting at Zanzibar, learned of Livingstone's death, but went on, mapped Lake Tanganyika, found that the Lualaba was really the Congo, and reached Benguela in 1875, having crossed the continent.

While the solution of the problem of the sources of the Nile was being achieved, important accessions were made to the knowledge of the geography of western Africa. Du Chaillu explored the country back of the Gabun and the region of the Ogowe, and Burton in 1861 scaled the peak of Kamerun.

Dr. Gerhard Rohlfs (q.v.), a German serving in the foreign legion in Algeria, began to make explorations in Algeria and Morocco about 1860 and in 1866 succeeded in making the journey across the desert to the Gulf of Guinea. Another German, Dr. Nachtigal (q.v.), intrusted by the Prussian government with a mission to the Sultan of Bornu, started from Tripoli in 1868, explored the mountains in the central Sahara, and the whole of the eastern Sahara and Sudan. In 1875 Stanley circumnavigated the great lake, Victoria Nyanza, crossed to the Congo, embarked upon that river at Nyangwe in 1876, and followed its course to the Atlantic, which he reached in August, 1877. In 1882 E. C. Hore circumnavigated Lake Tanganyika, and his survey was long the basis of its map, later modified, however, by more scientific measurements. Schweinfurth (q.v.), a native of Riga, ascended the White Nile in 1868, discovered the Welle River, and returned to Egypt in 1872, having accumulated a large amount of information. Leopold II, King of the Belgians, took an active interest in the work going on in Africa and in 1876 organized the International African Association, in which most of the European countries were associated. Several geographical and scientific expeditions

were the product of this organization, and stations were opened from Zanzibar to Tanganyika. In 1879 Stanley was sent into the Congo country, supported by funds furnished chiefly by Leopold, and worked for five years in that region in the name of the association. Several thousand treaties were made with native chiefs, by which territorial rights of more or less value were acquired, and permanent posts, with regular routes of trade and travel, were established along the course of the river. The purpose was to found a state which should be a civilizing centre in the heart of Africa. For a time there was some international interest in the project; but for several years those European powers which had been active in African exploration had been looking forward to possible political results, and the institution of such a state, with a territory comprising about one-eleventh of the whole continent, seems to have been the signal for the rise of territorial claims on all sides. Interest in the international enterprise died out, and the King of the Belgians was left free to develop the Congo State into a Belgian dependency. The English hoped to make it an English possession, and the attempt of Great Britain to come to an agreement with Portugal, whose territory in the southwest touched that of the Congo State, led to the assembling in 1884 of the Berlin Conference, called to bring about an international agreement in African affairs. The results of this conference are described in a subsequent paragraph. The State was annexed to Belgium in 1908 and is now known as the Belgian Colony of the Congo (Belgian Congo).

Of the long list of African explorers up to this time only those have been mentioned whose work marked a distinct advance in the knowledge of the continent. There may be added to the number, prior to 1885, the Portuguese Serpa Pinto (1877-79), and Capello and Ivens (1884-85), who made valuable explorations in South Africa; Junker (1880-83), a traveler, whose examination of the western watershed of the Nile was of great value; Joseph Thomson (1883-84), who made thorough studies of the mountainous country between Mombasa and the lakes and likewise in West Africa and the Atlas Mountains; Wissmann (1881-82), who crossed the continent and returned through the southern side of the Congo basin; Oscar Lenz, who in 1879-87 went from Morocco to Senegambia by the way of Timbuktu, ascended the Congo, and traveled to the Zambezi by the way of Tanganyika; Brazza, who explored the country between the Ogowe and Congo; and Emil Holub, who added greatly to the knowledge of the natural history of South Africa.

Much has been done in the way of exploration since 1885, the object generally being to perfect geographical and scientific knowledge of the different regions. Of such expeditions, the best known and one of the most noteworthy was Stanley's mission, undertaken in 1887, in search of Gordon's lieutenant, the German Schnitzer, better known as Emin Pasha, who had retreated into the interior after the fall of Khartum. Stanley went up the Congo and crossed to Zanzibar. On the journey he traversed the dense and vast forest inhabited by diminutive savages, and thus confirmed ancient accounts of African Pygmies. The predominance of the British in Egypt and in South Africa, and the fact that the territory under British influence stretches with but one break (German East Africa) from the mouth

of the Nile to Cape Town, has given rise to the project of a trunk line railway "from the Cape to Cairo," a project which is likely to be carried out at no distant day, with far-reaching consequences in the development of the continent. This plan led to the crossing of the continent from south to north by Ewart S. Grogan and Arthur Sharp in 1899. This journey was productive of much valuable information regarding the country which the transcontinental line is expected to traverse in the volcanic region around Lake Kivu and on the eastern shores of Lake Albert Edward and the Upper Nile. A host of scientific investigators and explorers have in the last 20 years done useful work in various African fields. Among such, special reference should be made to Donaldson Smith in connection with explorations in Somaliland. Two notable expeditions of recent years were those of Marchand, who in 1896-98 traversed the continent from Loanga in French Congo to Fashoda on the Nile, and Foureau, whose journey in 1900 across the Sahara from Algeria to Lake Chad marked an epoch in African exploration. The Chad region and the Sahara have received the particular attention of French explorers. Between 1902 and 1904 Loeffler and Lenfant established the existence of a channel between the Shari and the Binue rivers, thus showing a possible water connection between Lake Chad and the Atlantic. Chevalier in 1902-04 explored the region south of Wadai and Darfur constituting the watershed of the Congo, the Shari, and the Nile. Between 1900 and 1904 Ch. Pierre crossed the continent, following the same general route as Marchand. The western Sahara was crossed in 1904 for the first time since Caillié's journey of 1828 by Laperrine and Théveniaut, who, setting out from Ain Salah and Timbuktu respectively, met at Timiaouine in 21° north latitude. In 1904-05 an expedition under Alexander and Gosling was active in the Chad region. In 1905 Gautier crossed the Sahara from Tuat to the Niger. Among other great explorations were those of Dr. F. Stuhlmann, who studied part of the region to the west of Victoria Nyanza late in the last century, and Dr. Hans Meyer, the first to ascend Mount Kilimanjaro. About 1890 the era of great explorations began gradually to be superseded by the present period of the detailed study of Africa's geography, peoples, and resources. The colonial powers began to give great attention to surveys and map-making. This work advanced so rapidly in nearly all the colonies that there were in 1913 good economic maps of most of them showing topographic and climatic variations, the distribution of great forests, swamps, dry areas, plains, highlands, minerals, and other export products, the development of railroads and navigation, etc. Such maps were of prime importance in the shaping of all kinds of enterprise. The intensive study of many parts of Africa had thus far revealed several large areas within the tropics where the white race might live and toil in comparative comfort. Selected white immigrants were invited to make new homes in some of these regions, as in British and German East Africa from 5500 to nearly 8000 feet above sea level and on the high plateau of Katanga in the Belgian Congo. Thousands of white settlers were then engaged in farming and mining on the plateau of southern Rhodesia. Agricultural experiment stations, supported in all the colonies, discovered many facts that helped to

develop farming on a practical basis for the supply of commodities both for home and foreign consumption. The development of railroads had been remarkable. In 1913 the great copper field of Katanga (Belgian Congo) was connected by rail with Capetown, over 2100 miles to the south; the line from Cairo extended to Senaar on the Blue Nile, and a branch had been built across the White Nile to El Obeid, the capital of Kordofan; the Belgian Congo had nearly completed the construction of railroads around all the rapids in the Upper Congo so as to connect the Congo mouth with Katanga by rail; both Victoria Nyanza and Lake Tanganyika were joined with the Indian Ocean by rail; and the Upper and Middle Niger were connected at three points with the sea by rail, the most southern of these roads extending to Kano, the leading commercial centre of the Central Sudan, passing through the great cotton area of northern Nigeria. The volume of trade relations between all the colonies and the home countries was steadily increasing. Many enterprises in Africa depend upon the development of a sufficient supply of native labor. All the colonial governments were carrying out wisely devised plans for industrial training; and the natives were selling to the whites a tremendous total of manual service and more of it every year.

The Partition of Africa. The partition of Africa among the European powers may well be dated from the Berlin Conference of 1884. Before that date, it is true, settlements and conquests had been made, but they were more scientific and commercial, as a general rule, than political, with ill-defined and uncertain boundaries, unsanctioned by international agreement. The Conference was called to determine the status of the Congo territory held in trust for civilization by the African International Association. This it accomplished by establishing the Congo Free State with the King of the Belgians at its head. (See BELGIAN CONGO.) It also defined the general spheres of influence of the powers in Africa so that the series of African boundary treaties and agreements since that date are virtually executory provisions added to the Berlin Convention. Three such treaties were concluded by Great Britain in 1890. The first of these, by far the most important, was the Anglo-Saxon agreement, signed in Berlin, July 1. It was a diplomatic stale-mate: Great Britain, by securing Uganda, thwarted the German dream of an east to west connection across the heart of Africa on German soil; Germany, on the other hand, by the extension of German Southeast Africa to the boundaries of the Belgian Congo, prevented effectually the erection of a Cape-to-Cairo railway under the British flag. The second treaty, the Anglo-French agreement, signed in London, August 5, recognized a British protectorate over Zanzibar and Pemba, a French protectorate over Madagascar, and a French sphere of influence extending from Algeria southward to a line from Say on the Niger to Lake Chad. The third treaty, the Anglo-Portuguese agreement, August 20 and November 14, determined the respective territorial rights of Great Britain and Portugal in the dark continent. Two larger problems now remained unsettled—the control of the upper valley of the Nile and of Morocco. The first of these regions, as a result of the Fashoda incident (q.v.), fell to Great Britain, the second to France. Twice since then, in 1905 and in 1911, Germany has

blocked the French program (see MOROCCO), but in 1912 the independence of that country formally came to an end, and the French protectorate was recognized. In the meanwhile, the Orange Free State and the Transvaal lost their independence in the Boer War (q.v.), Belgium annexed the Congo Free State and Italy seized Tripoli, so that Abyssinia and Liberia remain the only independent nations in Africa. The United States has made arrangements for the supervision of Liberian finance.

The partition may be summarized thus: In the northeast, Egypt, nominally under Turkish suzerainty, is really under British control, while Egypt and Great Britain exercise a joint sovereignty over the eastern Sudan. Tripoli is now Italian. Tunis and Algeria belong to France, whose influence reaches down across the Sahara to the upper waters of the Congo. On the west coast, below Morocco, lies the small Rio de Oro possession of Spain. Then come French Mauritania and Senegal, British Gambia, Portuguese Guinea, French Guinea, the British Sierra Leone, Liberia, another block of French territory, the British Gold Coast and Ashanti, German Togoland, French Dahomey, the extensive British Niger territories, and German Kamerun. Off the coast of Kamerun lies the Spanish island of Fernando Po, to which are attached some other small islands and a small district on the mainland cut out of the French Congo territory. Below the latter lies the wedge of territory owned by Portugal called Kabinda. Then comes the French Congo, followed in succession by Portuguese Angola and German Southwest Africa. The Union of South Africa is then reached, which comprises the federated British colonies of Cape of Good Hope, Natal, the Orange Free State, and the Transvaal. North of the Union of South Africa on the east coast lies Portuguese East Africa. Between it and German Southwest Africa, on the opposite or west coast, lie the British protectorate of Bechuanaland and the British colony of Rhodesia. North of Portuguese East Africa is German East Africa, which occupies the east coast north of Lake Nyassa and the Rovuma River. Still farther north is British East Africa (western portion Uganda), which touches on the north the British sphere of influence in the Sudan, Abyssinia, and, on the coast, Italian Somaliland. West of the latter on the Gulf of Aden is the British Somali Coast Protectorate, then French Somaliland, Italian Eritrea, the four territories last named shutting off Abyssinia from the coast.

The area of Africa was estimated in 1904 at about 11,500,000 square miles, inclusive of islands, and the population at about 140,000,000. The political distribution of area and population according to the latest available figures is approximately as follows:

UNDER EUROPEAN CONTROL

COUNTRY	AREA SQUARE MILES	POPULATION
British Empire.....	3,700,000*	52,325,000*
France.....	4,641,000†	29,577,000†
Germany.....	931,000	13,420,000
Portugal.....	794,000‡	8,244,000‡
Italy.....	593,000	1,579,000
Spain.....	88,000§	660,000§
Belgium (Belgian Congo).....	909,000	15,000,000

* Including Egypt and the Sudan.

† Including Madagascar.

‡ Not including Madeira and the Azores.

§ Including the Canary Islands.

INDEPENDENT STATES

Abyssinia.....	432,000	8,000,000
Liberia.....	40,000	1,800,000

See WAR IN EUROPE.

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AFRICAINNE, L', là'frè'kàn' (Fr. The African). A French opera by Giacomo Meyerbeer (q.v.). The words are by Scribe, and it was produced in Paris, April 28, 1865, a year after the composer's death.

AF'RICAN'DER. See AFRIKANDER.

AF'RICAN HAIR. See CHAMÆROPS.

AFRICAN IN'TERNA'TIONAL ASSO'CI-A'TION. In 1876 the King of Belgium called a conference at Brussels of geographers and explorers to consider means for the opening up of Africa to civilization, and there the African International Association was formed, with the object of establishing stations for scientific purposes in eastern Africa. When H. M. Stanley in 1877 revealed the magnitude and importance of the fertile Congo basin, a second conference was assembled at Brussels, at which the African International Association made plans which extended its field of operation over the newly explored territory. But the greed of the different nations, awakened by the dazzling territorial and commercial prospects the Congo basin afforded, brought about endless disputes, until at length it was decided, by the mutual consent of all the great powers, including the United States, to leave the final adjustment of the difficulties to an international conference in Berlin. The conference opened at Berlin, Nov. 17, 1884, with Prince Bismarck in the chair, and ended its labors Feb. 26, 1885. Fifteen States were represented. As a result of mutual compromises, it was declared that the immense regions forming the basin of the Congo River and its tributaries shall be neutral territory, that perfectly free trade shall exist there, that citizens of any country may undertake every species of transportation within its limits, that the powers exercising sovereign rights over neighboring territory are forbidden to exercise monopolies or favors of any kind in regard to trade, and that they shall bind themselves to suppress slavery. The King of Belgium was made sovereign of the new State. See AFRICA; BELGIAN CONGO; STANLEY, H. M.

AFRICAN LAN'GUAGES. Of the numerous classifications of African languages, that which best represents our present knowledge is the following:

1. **Semitic.** Arabic; the Abyssinian languages derived from Geez (the so-called Ethiopic), i.e., Tigré, Tigriña, Amharic, Harari, Gurague. The languages comprised in this division were brought into Africa by Semitic immigrants or invaders.

2. **Hamitic.** Libyan dialects; ancient Egyptian (whence Coptic, now extinct), Bishari (Beja, Bedaue), Saho, Afar, various Agau dialects of Abyssinia (Chamir, Quara, etc.), and of the highlands south of it (Kaffa, Kullo, etc.), Galla, and Somali, Haussa in the west of the Sudan. Quite recently Meinhof has included Ful, Masai, and Hottentot among the Hamitic tongues, but the theory has not yet been under fire for a sufficiently long time to estimate its value. So far as the Hottentot is concerned, it is certainly not convincing, though Von Luschan has tried to prop it up with cultural evidence, such as the pastoral life of both Hottentot and Hamitic tribes.

3. **Hottentot.** For the reasons given above, this language must for the present be considered distinct from the Hamitic stock, the most significant trait shared with members of that family being the category of sex gender. Im-

portant as this feature is, it hardly suffices to establish genetic relationship even of a remote kind.

4. **Bushman.** As there is no anthropological, so there is practically no linguistic, justification for uniting Bushman and Hottentot in a single group. One reason for so classifying them has been a phonetic one. Both Bushmen and Hottentot use "clicks" as normal elements of speech combined in the same words with other elements, while we employ clicks only as interjections, in urging on horses, expressing anger, sympathy, etc. It is a fact, however, established by North American data, that phonetic peculiarities do not necessarily coincide with linguistic boundaries. Some African scholars have suggested that the clicks were originally peculiar to the Bushman language and adopted by the Hottentot. Indeed, such a process of borrowing has almost certainly occurred in some South African Bantu dialects, notably Zulu, which also employ clicks, though these are lacking in the majority of Bantu languages.

5. **The Bantu Family,** which embraces, roughly speaking, all Africa south of the equator. A characteristic type is represented by the language of the Zulu Kaffirs and their nearest relatives. To what extent corrupt Bantu dialects are spoken on the western coast has not yet been determined.

6. **The Sudanese Family.** North of the Bantu-speaking Negroes and south of the Hamitic and Semitic tribes of North Africa there dwell Negroes whose speech showed until recently a bewildering number of distinct languages, even within relatively narrow territories. This diversity stood in marked contrast to the uniformity of language in the Bantu area. Quite recently, however, Westermann has advanced the important theory that many of these supposedly distinct tongues, including some of the eastern as well as the western Sudan, were related and might thus be classed together as the Sudanese family. Among the traits common to all, the monosyllabic character of the root words is laid stress upon. It cannot be said that this theory, however valuable and suggestive in bringing order into what was once chaos, has already been definitely established. It represents, however, the latest thought of one of the best of African linguists and has secured the support of so eminent an ethnographer as Professor von Luschan (in Buschan's *Illustrierte Völkerkunde*, art. "Afrika").

The line of demarcation between the Sudanese and Bantu has not yet been accurately determined throughout its entire course. It certainly passes through the Kamerun, within which both Bantu and Sudanese populations are found, and through the northeasternmost part of the Congo. A tentative linguistic map has been published by Westermann. See BIBLIOGRAPHY.

The Malagasy language, spoken on the island of Madagascar, belongs to the Malay family of speech. By reason of its geographical position it need not be considered here.

Writing. The use of writing and the necessity for it imply a degree of civilization to which the majority of the inhabitants of Africa have never risen. It is, therefore, almost exclusively the white race, represented by the Hamites and the Semitic immigrants, which comes into consideration here.

Semitic. In the Semitic family we have the Phœnician alphabet, used by the Carthaginians

along the northern coast. The Punic and later Neo-Punic characters were modifications of the Phœnician and are distinguished by special characteristics. The Arabic character is now used wherever Islam has become the prevailing religion; but it is mainly employed for writing the Arabic language, which forms the general medium of religion, commerce, and social intercourse. The use of the Arabic character for African languages is not very frequent (e.g., among the Berbers, the Suahelis). The Malayan immigrants, however, and the Mohammedan Kaffirs use it as far south as Cape Colony; and the Mohammedans of Shoa as well as the inhabitants — also Mohammedans — of Harrar sometimes write their respective languages, Amharic and the closely related Harrari, in Arabic letters. On the other hand, in and around Abyssinia a number of languages are regularly written in the Amharic modification, or rather amplification, of the old Ethiopic or Geez alphabet. Unlike most of the other Semitic languages, Ethiopic and its modern descendants are written from left to right. The vowels are expressed graphically by modifications of or slight additions to the consonants, thus forming a kind of syllabary. We can trace this peculiar system of writing as far back as the fourth century A.D., through some ancient monuments in the old capital of Axum (consult D. H. Müller, *Epigraphische Denkmäler aus Abessinien*, 1894). The development of those peculiarities took place on African soil, though the consonantal characters are derived from the old South Arabian writing (wrongly called Himyaritic). See ETHIOPIC WRITING.

Ancient Egyptian. From the Egyptian hieroglyphic writing was developed a cursive form, the Hieratic, and this in turn gave rise to the still more cursive Demotic. All these have long since passed out of use, though Coptic, which survives only as the ritual language of the native Egyptian church, retains in its alphabet a few characters derived from the Demotic.

Ethiopian. The ancient Ethiopians of Napata and Meroë had, beside the Egyptian systems of writing, which they used almost exclusively for the Egyptian language, a cursive system of their own for the native idiom. As the few inscriptions in this character which have been preserved have not yet been deciphered, it is not possible to say anything positive about it. It is even doubtful what language these inscriptions represent, although it is perhaps nearer to the (negroid) Nuba than to the Hamitic Beja or Bishari. The alphabet was evidently borrowed from outside sources, though whether Egyptian or South-Arabian elements underlie it cannot at present be determined.

Libyan or Numidian. The old Libyan or Numidian writing, a very imperfect system, goes back to the ancient alphabet of South Arabia (as Euting has clearly shown), and not to Punic. It is represented by many inscriptions in Algeria and Tunis. The first decipherment, on the basis of the famous bilingual inscription of Tukka, is due to Blau (see also Halévy, *Essai d'épigraphie Libyque*, 1875, a collection by Faidherbe, 1870, etc.). It is worthy of note that the ancient funeral inscriptions in this character read from below upward. This system is similar to the *tifinaghen* or alphabet of the modern Sahara tribes (or Tuaregs). Oudney is said to have been the first who observed and called attention to their peculiar system of writing

(1822). The best description of the alphabet is to be found in Hanoteau, *Grammaire de la langue Tamachek* (1860).

Negro. Only one Negro language has developed a writing of its own, the Vei, on the west coast near Cape Mount. Doalu Bukere, a native who knew something of the Roman character, invented it about the year 1834. The writing was afterward used for Mohammedan missionary work. It is a clumsy syllabary with complicated forms sometimes suggestive of hieroglyphics, and quite distinct from European or Arabic writing. A number of books have been written in it, but the Christian missionaries have declined to use it, and it is dying out. It has received considerable attention from linguists, as the only case known in which the actual invention of a system of writing, in popular use, can be clearly shown. The idea, however, was certainly borrowed from the Europeans. Consult Steinthal, *Die Mandé-Neger-Sprachen* (Berlin, 1867).

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In recent years it has become more and more customary to record the myths, tales, proverbs—in other words, what had formerly been the unwritten literature of primitive tribes—in the original by means of phonetic writing. Of the numerous African publications of this sort only a few can be here referred to. Callaway's Zulu works form a pioneer effort for the Bantu tongues. Spieth's *Die Ewe* is perhaps the most noteworthy collection of Sudanese texts. A splendid series of Hottentot fables and other tales will be found in Schultze's *Aus Namaland und Kalahari*; and some of Bleek's long-delayed Bushman material, revised by Miss Lloyd, has at last appeared in book form. Hollis's *The Masai* represents the possibly Hamitic tribes of East Africa.

AFRICAN METH'ODIST EPIS'COPAL CHURCH. See METHODISM.

AFRICAN METH'ODIST EPIS'COPAL ZI'ON CHURCH. See METHODISM.

AFRICAN MIL'LET. See SORGHUM, NON-SACCHARINE.

AFRICAN OAK. See TEAK.

AF'RICA'NUS. An *agnomen* (q.v.) borne by two of the Scipios. See SCIPIO.

AFRICANUS, SEXTUS JULIUS. A Christian writer. He was born in Libya, and made his home in Emmaus, near Jerusalem, from 195 on till after 240, but traveled extensively through Asia Minor. He is remembered for his chronology from the creation to 221, of which frag-

ments are preserved. These and portions of other writings are printed in Migne, *Patrologia Græca*, x, 51-108, xi, 41-48; Eng. trans., *Ante-Nicene Fathers* (New York ed.), vi, 123-140.

AF'RICAN WAR, THE. In Roman history, the war between Julius Cæsar and the members of the Pompeian party who, after the battle of Pharsalia, renewed the conflict in Africa and were defeated at Thapsus, 46 B.C. The account known as the *Bellum Africanum* attached to the works of Cæsar is of uncertain authorship.

AFRIDI, à-fré'dê. See INDIA, *History*.

AFRIDIS, à-fré'dêz. One of the Afghan or Pathan peoples of the Indo-Afghan border who have of recent years come into hostile contact with the British authorities. In their somewhat savage yet intelligent semi-independence they represent, perhaps, ancient Aryan society of an early type. A brief account of them by Holdich appeared in the *Journal of the Anthropological Institute* (London) for 1899; see also the same author's *The Indian Borderland* (London, 1901).

AF'RIKAN'DER. The Dutch form for "African," used of white persons born in South Africa, especially the Boers.

AFRIKANDER BUND, bunt, or BOND. An association in South Africa designed to consolidate Afrikaner influence and eventually to form an independent union of the South African States. With its present name it dates from 1880. As a political party in Cape Colony it for a time supported the policy of Cecil Rhodes, but after the Jameson raid (1895) it separated itself from him. In 1898 it secured a majority in the colonial legislature. While it urged President Kruger to a more liberal policy, it favored the Boers in the war with Great Britain. On Dec. 6, 1900, an Afrikaner congress was held at Worcester, Cape Colony, which demanded Boer independence and condemned the war. After the war (December, 1902), the Bund was reorganized to further the federation of the South African colonies under the British crown, and became largely identified with the South African party, which represented the interests of the Afrikanders without assuming an exclusively Dutch character.

AFRITE, àf'rêt. A powerful spirit, or jinn (Lat. *genius*), figuring in the stories of *A Thousand and One Nights*.

AF'TER-GLOW'. See TWILIGHT.

AF'TER-IM'AGES. Retinal images which appear after the eye has been removed from some illuminated object. When we light our lamp in the evening, we are distinctly conscious that the illumination has a reddish-yellow tinge. As time goes on, however, we lose the color; the paper on which we write seems to be as white as the same paper seen in diffuse daylight; our eyes have become adapted, or have grown used, to their surroundings (*general adaptation*). The law of adaptation is that all brightnesses tend toward a middle gray, and all colors toward neutrality. Adaptation leaves an after-effect, which is termed *disposition*. A yellow-adapted eye is disposed to the complementary color, or blue-sighted: all the yellows that it sees tend toward gray, and all other colors take on a tinge of the complementary blue. See CONTRAST; VISUAL SENSATION.

Adaptation may be *local*, as well as general. Suppose, e.g., that I fixate steadily a green disk seen upon an extended white background. The part of the retina upon which the green falls will become green-adapted, and therefore red-

disposed or red-sighted. Hence, if I presently remove the green disk, I shall see a subjective red disk in its place. This red, the after-effect of local adaptation, is termed (1) the *negative after-image*. The color and brightness of the after-image are always complementary to the color and brightness of the preceding stimulus; a dark-blue stimulus gives a bright yellow after-image, and a bright yellow stimulus a dark-blue after-image. If one stares for half a minute at a window that gives upon a bright gray sky or a snowy landscape, and then turns one's eyes upon a gray screen or wall, one sees an after-image window with white bars and black panes. In general, the vividness and duration of the negative after-image depend upon the intensity and duration of the stimulus which evokes it and on the brightness of the surface upon which the after-image is projected for observation. It is probable, although the point is still disputed, that the course of the after-image is intermittent, not continuous. Theoretically important is the fact that a contrast-color (see CONTRAST) set up in the neighborhood of the stimulus is effective in the after-image; thus, a disk of red paper seen on a gray background, and giving a narrow green ring of marginal contrast, appears in the after-image as a green disk surrounded by a distinct reddish halo. (2) If the original stimulus be very strong and of brief duration, it may give rise to what has been called the *positive after-image*, a subjective phenomenon in which the stimulus-sensation is reproduced, only with diminished brightness and saturation. (See VISUAL SENSATION.) Thus, a flash of brilliant red light would be followed, first, by a brief but noticeable blank interval; then by the positive after-image, a duller and pinker red; then by a second interval, somewhat longer than the first; and, finally, by the dark-green negative image. The usual explanation of this positive image is that the physiological effect of stimulation persists for some time after the physical stimulus itself has ceased to operate; the sensation, therefore, outlasts the stimulus, remaining the same in kind throughout its course. This account is, however, as inadequate as is the theory which would account for the negative after-image on the score of retinal fatigue. It is disproved by the single fact that the short interval which elapses between stimulus and positive image (the first interval described above as "blank") may, under certain circumstances, be filled by a *positive and complementary image*. Thus, if a glowing red point be moved slowly to and fro in the dark, one sees first a trail of red light (due to the stimulus and its direct after-effect), and then a bright (positive) green streak. Then should follow, if the series is complete, the positive image proper, a dull red, the second blank interval, and the negative green image. The dull red is, evidently, not a direct continuation of the red of the stimulus. No satisfactory theory is as yet forthcoming.

Especial interest attaches to the colored images obtained from intensive stimulation with white light. Close your eyes and keep them closed until there is no trace of previous stimulation (no colored after-image) on the dark field. Then fixate for some 20 seconds the middle bar of a window which looks out upon a brilliantly white sky. Close your eyes again, and note the development of the after-image on the dark field. You see a color sequence, which

is known technically as the *flight of colors*. The current explanation of the phenomenon is that the white light of the sky is broken up into its physical components, in somewhat the same way as a ray of light passing through a prism is broken up into the series of spectral colors; and that the retinal excitations corresponding to the red, green, and violet stimuli (the part-stimuli contained in the white light) are not exactly coincident, but overlap in time, so that now the one and now the other shows itself in the after-image. It is, however, noteworthy that the flight of colors, under conditions of exact observation, shows unmistakable evidence of two overlapping complementary series. The sequence is: a momentary positive image; then, after fluctuations, a blue, a green, a yellow, a red (at this stage the image becomes negative), a blue, and a green image. We have, that is, the series blue-yellow-blue and the series green-red-green laid over one another; there is clear indication of antagonism or complementarism, but none of a general breaking up of the white light into its spectral components. We must remember, also, that "white" light is never quite colorless; there is always some tinge of color in diffuse daylight. The facts point to the validity of an "antagonistic" theory of visual sensation (q.v.). (3) We may note, finally, the existence of a *binocular* or transferred after-image. If one eye be stimulated, under suitable conditions, a faint, positive image appears in the field of the other, unstimulated eye. Lay a bright red-orange disk upon a sheet of white paper and fixate it monocularly for 5 or 10 seconds. Then blow away the disk, close the stimulated eye, open the unstimulated one and fixate the white ground. You see at first a pale-yellowish image. Then the field darkens and a blue negative image makes its appearance. Presently the ground clears and the yellowish patch comes once more. Then the white darkens again and the blue image recurs. The darkening is due to retinal rivalry: the dark field of the closed (stimulated) eye is superposed upon the bright field of the open (unstimulated) eye. The blue image is the negative after-image belonging to the dark field, i.e., to the originally stimulated eye; its appearance requires no explanation. On the other hand, the faint yellowish image belongs to the unstimulated eye, is an after-effect of the orange stimulation, but an after-effect that differs entirely from the after-effect in the stimulated eye, and that has been transferred to the eye which was not exposed to the stimulus. Its existence points to a close functional inter-relation between the two halves of the visual apparatus. Consult H. von Helmholtz, *Physiologische Optik* (Hamburg, 1909-11); E. Hering, *Zur Lehre vom Lichtsinne* (Vienna, 1878); O. Kuelpe, *Outlines of Psychology* (London, 1909); E. B. Titchener, *Experimental Psychology* (New York, 1901).

AFZE'LIUS, *Sw. pron.* áf-sā'li-us, ADAM (1750-1837). A distinguished Swedish botanist who resigned the chair of Oriental languages at the University of Upsala to pursue the work that was more congenial to him. After some years spent in arduous study, he founded the Linnæan Institute at Upsala (1802) and later wrote the standard biography of Linnæus (1823).

AFZELIUS, ARVID AUGUST (1785-1871). A Swedish poet and antiquary. He translated the *Elder Edda* (see EDDA), and, with Geijer, edited a noteworthy collection of old Swedish popular

songs (1814-17). He is esteemed for his poetical *Romances* and for his studies in Norse history and literature, writing a history of Sweden to the time of Charles XII.

AGADES, ä'gä-dez. An African city, the capital of the oasis kingdom of Air (q.v.), situated in lat. 16° 30' N. and long. 8° E. (Map: Africa, E 3). It is built on the edge of a plateau about half a mile high and was formerly an important stronghold with a population estimated at 50,000. Although still on the caravan route between Sokoto and the Barbary States, its commercial importance has disappeared, and its population has dwindled to about 7000.

AGADIR, ä'gädēr'. A seaport in the southern part of Morocco, North Africa, situated in lat. 30° 27' N. and long. 9° 36' W. (Map: Africa, D 1). It was founded in the beginning of the sixteenth century by the Portuguese, but was soon taken by Morocco and for a considerable period was an important shipping centre because of its location at the mouth of the Sus River. It is now closed to commerce, and is used as a customs station on the caravan route connecting the northern and southern parts of Morocco. It became the object of international attention in 1911, when Germany announced that the gunboat *Panther* had been sent to the port of Agadir for the protection of German interests. For an account of the crisis that followed between the German and French governments, see MOROCCO, *History*. Its population is about 1000.

A'GAG (Heb., Gk. 'Αγάγ, in the Septuagint). 1. The name, or possibly title, of a king of the Amalekites conquered by Saul, and preserved alive contrary to the command of Jehovah. He was afterward hewn in pieces by Samuel. (See 1 Sam. xv.) 2. In Dryden's *Absalom and Achitophel*, a character standing for Sir Edmund Berry Godfrey, the justice of the peace who was assassinated shortly after disclosing the revelations made to him by Titus Oates.

A'GAGITE. A name applied to Haman (Esther iii. 1, 10; viii. 3). It is a term of contempt, designating him as a worthy descendant of Agag, the Amalekite whom Samuel hewed to pieces as a sacrifice to Yahwe at Gilgal (1 Sam. xv. 33). This "Amalekite" is opposed to Mordecai, a descendant of Kish, the father of Saul (Esther ii. 5). The Greek translator understood that this was a mere fiction setting forth the struggle between Jew and Gentile, when he rendered the term "Macedonian."

AGALACTIA, äg'ä-läk'shī-ä (Gk. want of milk, from *á*, *a*, priv. + *γάλα*, *gala*, milk). A deficiency, either of quantity or quality, in the secretion of milk after delivery. It may be due to exhausting diseases such as pulmonary tuberculosis or syphilis; to severe hemorrhage, emotional disturbances, or a poor diet. Syphilitic or phthisical mothers should not nurse their infants, for obvious reasons. The secretion of milk may often be encouraged by a generous diet, including an abundance of milk and cream. Malt liquors (porter, stout) in small quantities are popular galactagogues. Drugs are of little or no value. (See MILK.) Agalactia is a contagious disease in sheep and goats, characterized by inflammatory foci in the mammary gland, eyes, and articulations. The disease has been known since 1816 and is especially frequent in Italy, France, and Spain. In the acute form there is high fever accompanied by complete, or almost complete, failure of milk. Death

takes place after 20 days in about 15 per cent of cases.

AG'ALMAT'OLITE. A hydrated aluminum and potassium silicate of variable composition corresponding to the minerals pinite, pyrophyllite, and talc, (q.v.). It occurs massive, and in color is gray, to green and yellow, brown and red. It is regarded as an alteration product of iolite, and is found in Transylvania, in Saxony, and especially in China, where, owing to its softness, it is carved into images and various ornamental designs, in which advantage is taken of the different shades to bring out special portions in different colors.

AG'AMA (Caribbean name). A genus of more than 40 insectivorous ground-lizards allied to the iguanas, and confined to the warm climates of Africa, Australia, Asia, and southern Russia. The handsome armed agama, or toque (*Agama armata*) of South Africa is strikingly adorned and reaches 20 inches in length. Another very brilliant species is the spiny *Agama colonorum* of the Gold Coast. One of those of southeastern Europe best known is the stellio (*Agama stellio*), which is commonly tamed and kept in captivity by Arabic jugglers in Egypt, who call it *hardun*. This little reptile has the habit of running a short distance, stopping suddenly and solemnly nodding its head up and down several times. Mohammedans look upon this as a conscious travesty on their devotional attitudes and often kill the lizard on sight.

AGAMEDES, äg'ä-mē'dēz. See TROPHONIUS.

AG'AMEM'NON (Gk. 'Αγαμέμνων). Son of Atreus and brother of Menelaus. Agamemnon is a prominent figure in Greek heroic legend, though the details of his story differ. He ruled at Mycenæ and exercised lordship over much of the Peloponnesus. Therefore, when Paris carried off Helen (q.v.), the wife of Menelaus, Agamemnon was the natural leader of the expedition made against Troy to recover her. His quarrel with Achilles (q.v.) is the starting-point of the *Iliad*. Later writers told of the sacrifice of his daughter Iphigenia (q.v.) at Aulis to secure favorable winds for the voyage to Troy. In his share of the booty of Troy he received the prophetess Cassandra (q.v.), daughter of Priam. On his return to Mycenæ he was murdered by his wife Clytemnestra (q.v.) and her paramour, Ægisthus (q.v.). His son, Orestes (q.v.), aided by his daughter Electra, subsequently avenged his father. This tragedy of the house of Atreus was a favorite subject of the Greek dramatists. Consult especially the play of Æschylus (q.v.) called the *Agamemnon*, the first play of the trilogy commonly known as the Oresteia.

AG'AMEN'TICUS, MOUNT. A hill in York Co., Me., 4 miles from the coast, and the summit 673 feet above sea level. It lies in lat. 43° 13' 25" N. and long. 70° 41' 33" W. (Map: Maine, B 5) and is a noted landmark for sailors.

AG'AMOGEN'ESIS. See PARTHENOGENESIS, *Metagensis*.

AGAÑA, ä-gän'yä, or SAN IGNACIO DE AGAÑA, sän äg-nä'tē-ō dä ä-gän'yä. The capital of Guam (q.v.), one of the Ladrões, belonging to the United States (Map: Guam, U. S. and Dep. Ter., B 3). It is situated on the western coast of the island on Agaña Bay. It has wide, clean streets, and is traversed by a shallow stream crossed by two stone bridges. The bay is unsafe and the landing is obstructed by reefs. The town contains an arsenal, barracks,

churches, schools, and a college. During the Spanish régime in the Philippines it was the seat of government for the Ladrones. Pop., about 7000.

AG'ANIP'PE (Gk. Ἀγανίπη, *Aganippē*). A fountain in Bœotia, near Mount Helicon, which flowed to the river Permessus. The water was sacred to the Muses and was supposed to give poetic inspiration.

AGAO, á-gä'ô. See AGAU.

AG'APÆ (Gk. nom. pl. of ἀγάπη, *agapē*, love-feast). Love feasts, or feasts of charity, usually celebrated by the earliest Christians in connection with the Lord's Supper. The rich Christians presented their poorer brethren in the faith with gifts, and all ate together, in token of their equality before God and their brotherly harmony. The meetings were opened and closed with prayer, and during the feast spiritual songs were sung. At first a bishop or presbyter presided, who read a portion of the Scripture, proposed questions upon it, and received the various answers of the brethren. Afterward whatever information had been obtained regarding the other churches was read—such as the official letters of overseers, or private communications from eminent members; and thus a spirit of practical sympathy was engendered. Before the conclusion of the proceedings money was collected for widows, orphans, the poor, prisoners, and those who had suffered shipwreck. Then the members gave one another the holy kiss, and the feast was ended with a "philanthropic prayer." Generally the feast of the agape preceded the celebration of the Lord's Supper, but during the period of the persecutions, when the Christians had often to hold divine service before dawn, the agapæ were, for the most part, delayed till the evening. Later, a formal separation was made between the two rites. In the third and fourth centuries the agape had degenerated into a common banquet, where the deaths of relatives and the anniversaries of the martyrs were commemorated and where the clergy and the poor were guests; but with the increase of wealth and the decay of religious earnestness and purity in the Christian Church, these agapæ became occasions of great riotousness and debauchery. Councils declared against them, forbade the clergy to take any share in their celebration, and finally banished them from the Church. At the same time it must be admitted that the heathen ignorantly calumniated the practices of the Christians in these agapæ, and that the defense made by Tertullian, Minucius Felix, Origen, etc., is eminently convincing. In the present Moravian church, love feasts are held on various occasions, differing somewhat in different congregations. They are religious services of praise and prayer, accompanied by a small portion of food and drink, the whole expressive, as were the ancient agapæ, of brotherly love in the membership of the congregation. See LOVE FEASTS.

AGAPEMONE, äg'ä-pēm'ô-nē (modern compound from Gk. ἀγάπη, *agapē*, love + μονή, *monē*, a staying, stopping-place). A conventual establishment of a singular kind, consisting of persons of both sexes, founded at Charlynch, near Bridgewater, England, by Mr. Henry James Prince, formerly a clergyman of the Church of England. The inmates belong to a religious sect originating with Mr. Prince and a Mr. Starkey, also a clergyman, and are sometimes called Lam-

peter Brethren, from the place where Prince was educated and where he formed a revival society. Community of goods being insisted upon, the leaders acquired considerable property, and fitted up in luxurious style a dwelling near Charlynch. Prince, who was styled "The Lord," affirmed in his publications that he was sinless and was sent to redeem the body, "to conclude the day of grace, and to introduce the day of judgment." See Hepworth Dixon, *Spiritual Wives* (London, 1868), and the article by Miss Edith Sellers in *The Newbery House Magazine* (London, November, 1891), reprinted in *Magazine of Christian Literature* (New York, December, 1891).

A society similar in its aims and character, though not conventual in its form, existed in England in the sixteenth and seventeenth centuries. It was called "The Family of Love." Its founder is generally supposed to have been Heinrich Nikolaus, who was born at Münster, in Westphalia, Jan. 9 or 10, 1501 or 1502, but who lived a considerable time in Holland. He held himself to be greater than Moses or Christ, for the former only taught men to *hope*, and the latter to *believe*, while he first announced the doctrine of *love*. He founded his sect, "The House of Love" or "The Family of Love," in Emden, East Friesland, about 1540 and died in 1570. In the reign of Edward VI the sect appeared in England. By 1578 they had apparently increased in numbers considerably, for in that year one John Rogers published a work against them, entitled *The Displaying of an Horrible Secte of Grosse and Wicked Heretiques, naming themselves the Familie of Love, with the Lives of their Authors, and what Doctrine they teach in Corners* (2d ed., 1579). In 1580 Queen Elizabeth issued a proclamation for the hunting out and punishing of the "damnable sect." The family of love—"or lust, rather," as old Fuller has it—tried to insinuate themselves into the good graces of King James by presenting a petition casting aspersions on the Puritans. It had a brief prosperity, and was revived in the seventeenth century, but quickly died. Its name in New England in the seventeenth century was applied to some dissenters, but there is no evidence that there were any Familists there. Their doctrines seem to have been a species of pseudo-spiritual sentimentalism resulting in gross impurity. Consult Thomas, *The Family of Love*, "Haverford College Studies," No. 12 (Boston, 1893). See MUCKERS.

AG'APE'TÆ (fem. form of *Agapeti*). Early Christian virgins who lived, generally in all purity, in the same house with men bound to strict celibacy. See AGAPETI.

AG'APE'TI (nom. pl. of Gk. ἀγαπητός, *agapētos*, beloved). Early Christian men who lived in the same house with deaconesses, both being celibates. The growth of ascetic notions in the Church led to the supposition that all contact between the sexes, except in marriage, must lead to immoral conduct, and so in the fifth and sixth centuries the practice was condemned by the Church and by the civil power.

AG'APE'TUS. The name of two popes.—AGAPETUS I. Pope of Rome from 535 to 536. He was the son of Gordianus, a Roman priest who was killed in the riots under Pope Symmachus. The fear of an invasion of Italy by Justinian led Theodatus, the King of the Goths in Italy, to send Agapetus to Constantinople in 536 to sue for peace from the Emperor. Though

unsuccessful in this mission, Agapetus persuaded Justinian to depose Anthimus from the patriarchal see of Constantinople. He died at Constantinople. His festival is celebrated on the 20th of September by the Roman Catholic church.—AGAPETUS II. Pope of Rome from 946 to 955; a Roman by birth. His first act was to establish his political rule over the churches of the Empire. Against Berenger II, King of Italy, who was a troublesome neighbor to the little pontifical state, he invoked the aid of Otto I.

AGAPIDA, ä'gä-pē'dä, FRAY ANTONIO. The imaginary monkish chronicler from whose papers Washington Irving professed in his first introduction to that work to have compiled his *Conquest of Granada*. He was intended, Irving later explained, as a type of the piously prejudiced religious zealots of the time.

AGAR, ä'gär'. The stage name of Florence Léonide Charvin (1836-91). A French actress. She was born at Sedan, and went to Paris in 1858, where she made her début as a singer in cafés-concerts. Following the example of Rachel, she adopted the biblical name of Agar (Eng. Hagar). She scored her first great success in the title-part of Racine's tragedy *Phèdre*. In 1870 she was engaged at the Comédie Française, where, during a representation of the play *Le Lion Amoureux*, she sang the Marseillaise in the key of A, as Rachel had done in 1848. She appeared from 1872 to 1876 in many French classic dramas, chiefly tragedies. She was remarkable for her beauty, her mobile and expressive countenance, eloquence of gesture, and perfect diction.

AGAR AGAR. VEGETABLE GELATIN. A substance derived from a number of East Indian seaweeds. It is made principally in China and Japan and is marketed in thin transparent sheets, shreds, or sticks. One variety furnishes the characteristic ingredient of the Chinese dish, "bird's-nest pudding." Japanese agar agar is used chiefly as a culture medium for bacteria in the laboratory. Of late years the substance has found favor as a laxative. Given to the patient in a dry form, it absorbs moisture as it passes through the intestinal canal and by its bulk stimulates peristalsis. Otherwise it has no medicinal properties.

AGARDH, ä'gärd, JAKOB GEORG (1813-1901). A Swedish botanist, son of Karl Adolf Agardh. He was professor of botany at Lund during 1854-79. He increased his father's large collection and wrote several works on algæ. He also published *Theoria Systematis Plantarum* (1858).

AGARDH, KARL ADOLF (1785-1859). A Swedish botanist. He was educated at Lund and devoted himself chiefly to the study of algæ. In 1807 he became lecturer on mathematics at Lund, and in 1812 was appointed professor of botany and rural economy, lecturing at the same time on general economy. He became a priest in 1816; went into politics in 1817 and was elected to the Diet, where he exercised considerable influence, became a leading liberal, and succeeded in improving and raising the standard of education in Sweden. His work, *Systema Algarum* (1824), was an important contribution to the science of botany. He also wrote *Essai de reduire la physiologie végétale à des principes fondamentaux* (1828). In 1834 he was made Bishop of Karlstad. Agardh was author of several books and papers, chiefly on algæ, and a memoir on Linnæus.

AG'ARIC, AGAR'ICUS. See MUSHROOM.

AGAR'ICIN (from Gk. ἀγαρικόν, *agarikon*, a tree fungus). A substance known also as agaric, agaricic, agaricinic, or laricic acid, and obtained from the *Polyporus officinalis*, commonly called white agaric, touchwood, or punk. It is a white powder, slightly soluble in water. Its formula is $C_{16}H_{30}O_5 + H_2O$. It is used as an anhidrotic (q.v.) in the night sweats of phthisis.

AGASIAS, ä-gä'shī-as (Gk. Ἀγασίας). The name of two Ephesian sculptors, kinsmen, who lived at the beginning of the first century B.C. Agasias, son of Menophilus, made several statues of Romans on the island of Delos, to be set up in the Agora there. Agasias, son of Dositheus, was the sculptor of the "Borghese Gladiator" found at Antium (q.v.) and now in the Louvre. It probably represents a warrior on foot raising his shield, as if to guard against a mounted adversary. The figure seems derived from a group. It shows the characteristics of Asiatic art of the period.

AGASSIZ, äg'ä-sē, or ä-gäs'iz; French pron. ä'gä'sē', ALEXANDER (1835-1910). An American naturalist, capitalist, and philanthropist. He was born at Neuchâtel, Switzerland, Dec. 17, 1835, the only son of Louis Agassiz. He joined his father in Boston in 1849, and graduated at Harvard College in 1855. He was made a bachelor of science by the Lawrence Scientific School in 1857; became assistant in the United States Coast Survey in California in 1859, and was assistant in the Museum of Comparative Zoölogy at Harvard College from 1860 to 1865. At this time he became interested in coal and later in copper mining, and assisted in the development of the Calumet and Hecla mines of native copper on the south shores of Lake Superior. These mines were then in an unproductive condition, but Agassiz, as superintendent, applied his extensive knowledge of geology, chemistry, and engineering, and so developed them that they yielded to him and his associates great wealth, which he used to advance zoölogical research. After visiting different museums in Europe (1869-70), he was appointed curator (1874) of the Museum of Comparative Zoölogy, which his father had founded. He retained this position nominally until 1897 and was for some time a fellow of Harvard University. His chief interest was in marine zoölogy, where his studies of invertebrate life, and especially of the development of polyps, jellyfishes, and echinoderms, placed him in the first rank of investigators. He explored Lake Titicaca and the coast of Chile during 1874-75 and founded in 1875 a private laboratory and salt-water aquarium near his residence overlooking Narragansett Bay at Newport, R. I. He superintended deep-sea dredging among the West Indies, in the United States steamer *Blake*, from 1877 to 1880, and in successive winters he explored all the oceans, adding greatly to the knowledge of the fauna of the deep sea. His more important works are *North American Acalephs* (1865); *Revision of the Echini* (1872); *North American Starfishes* (1877); *Report on the Echini of the Challenger Expedition* (1881); *Three Cruises of the Blake* (1888); *The Islands and Coral Reefs of Fiji* (1899). The latter includes a philosophical discussion of the whole subject of coral formations. He continued this line of work in 1901-02 by a private expedition to the Maldivé Islands. Mr. Agassiz contributed a million or more dollars toward furthering the

study of zoölogy at Harvard University and elsewhere, always in an unostentatious way, and his abilities have been recognized by many universities and scientific societies in both Europe and the United States, where he was president of the National Academy of Science and of the American Academy of Arts and Sciences. Consult *Letters and Recollections of Alexander Agassiz*, edited by G. R. Agassiz (Boston, 1913).

AGASSIZ, ELIZABETH CABOT (CARY) (1822-1907). An American teacher and writer, born in Boston. In 1850 she was married to Prof. Louis Agassiz, whom she accompanied to Brazil (1865-66) and on the *Hassler* expedition in 1871-72. Her publications include *A First Lesson in Natural History* (1859); *Life of Louis Agassiz* (2 vols., 1885), and *Seaside Studies in Natural History* (1865), in which she was assisted by her step-son, Alexander Agassiz. Mrs. Agassiz's home was at Cambridge, Mass. She became president of the board of control of Radcliffe College and took an active part in promoting the interests of that institution.

AGASSIZ, LAKE. See LAKE AGASSIZ.

AGASSIZ, LOUIS (1807-73). An American naturalist, born at Motier, in the Canton of Fribourg, Switzerland. His father was a clergyman and his mother a woman of education and taste. Following a decided bent toward zoölogy, developed from childhood and fostered by his school preparation at Lausanne, he studied medicine and natural history at Zürich and Heidelberg, where he formed a lifelong and influential friendship with the botanist Alexander Braun. He studied also at Erlangen and at Munich, where he became acquainted with Martius and Spix, and when Spix died (1826), Agassiz prepared a description of his Brazilian fishes which attracted Cuvier's notice. After graduating in medicine and taking a degree in philosophy (1830), Agassiz studied in Paris under Cuvier, whose ardent disciple he henceforth was. From 1832 to 1846 Agassiz was professor of natural history at Neuchâtel and there completed his first great work, *Recherches sur les poissons fossiles* (5 vols., 311 plates, 1833-42). Several visits to England, beginning in 1834, enlarged his acquaintance and reputation and gave material for his *Fossil Fishes of the Old Red Sandstone* of the British Isles. Next he turned to echinoderms, which he studied in both living and fossil forms. Another product of his labors at this period was the *Nomenclatoris Zoölogici Index* (Sotothurn, 1842-46), of which a practical revision, bringing the lists of genera up to 1882, was made by Scudder and published as Bulletin No. 19, United States National Museum (Washington, 1882). From 1836 to 1845 Agassiz spent his summers in examining the glaciers of the Alps, often in company with A. Guyot, and illuminated and confirmed previous generalizations in respect to a former glacial epoch. In 1846 Agassiz was invited to the United States to give a series of lectures in the Lowell Institute course at Boston. These at once established his reputation as a lecturer and led to his appointment, in 1848, as professor of natural history in the Lawrence Scientific School of Harvard University, which chair he held, except a brief interval at Charleston, S. C., until his death, although he relinquished teaching long before that event. Agassiz came to America untrammelled and undertook the mission of teaching and advancing the cause of science in the United States with the utmost enthusi-

asm. His wife had died, but he presently remarried (see AGASSIZ, E. C.), and Mrs. Agassiz established in their house in Cambridge a school for girls, with which Professor Agassiz was identified. He traveled widely and lectured in various cities and in 1848 visited the Lake Superior region with a class of scientific students. This exploration was described in a narrative by Cabot, to which Agassiz contributed chapters on fishes. Similarly, he undertook, in 1850-51, a study of the Florida coral reefs, the results of which were set forth in lectures and in articles contributed to the *Atlantic Monthly* and subsequently gathered into two popular books, *Methods of Study in Natural History and Geological Sketches*. He was everywhere and foremost a teacher, interpreting his facts and theories with such enthusiastic force and persuasive eloquence that he was in constant demand. A series of lectures which he delivered in Brooklyn in 1862 were epoch-making in this direction. They were republished in book form as *The Structure of Animal Life* (New York, 1874). Many of his views were in advance of popular knowledge and opinion and contravened some established religious tenets; yet he rarely excited serious opposition, and no educational influence of his time was so great as that exerted by him. He may be said to have realized at this period the ambition which he expressed in a letter to his father in 1829: "I wish it may be said of Louis Agassiz that he was the first naturalist of his time, a good citizen and . . . beloved of those who knew him."

In 1858 the plans were laid for the great Museum of Comparative Zoölogy at Cambridge, Mass., now one of the most extensive and scientifically useful in the world; and for many years his main efforts were directed to building it up. He secured public appropriations and private gifts for it by his personal influence and kept himself poor by his unselfish labors and liberality toward it. He gathered about him there and trained a body of men who have made for America a creditable record in biology—Alexander Agassiz, his son; J. A. Allen, H. J. Clark, S. Garman, Alpheus Hyatt, D. S. Jordan, E. S. Morse, A. S. Packard, F. W. Putnam, N. S. Shaler, A. E. Verrill, and others.

In 1865 he visited Brazil with his wife and a body of assistants. The results of his researches there he published in his book, *A Journey in Brazil* (Boston, 1868). In 1872 he made a trip to California. In the summer of 1873 he held the first session of a summer school at the island of Penikese in Buzzard's Bay. This set an example that has led to the many summer schools and seaside laboratories since established in all parts of the country. During all these years he was prosecuting a continuous work on a great scale, entitled *Contributions to the Natural History of the United States*, of which four magnificent quarto volumes were published, the first, *An Essay on Classification*, in 1857, the others (monographs of American turtles and acalephs) soon after. The doctrine taught in these was a liberal advance upon the "special creation" views previously in vogue; yet when the Darwinian school of evolutionists arose they found in Agassiz a most earnest opponent, and it was a great grief to him to see that his scientific disciples were almost, without exception, becoming adherents to the new ideas. To stem this tide of scientific heresy, Professor Agassiz prepared

and delivered in Cambridge, in the spring of 1873, a course of six lectures, which attracted very wide attention. This was his final public work, for late in 1873 he was attacked by brain disease and died on December 14. He was buried with extraordinary honors in Mount Auburn Cemetery. His monument is a boulder brought from the glacier of the Aar, where he had made his most enlightening studies of glacial phenomena. Consult: Agassiz, *Life and Correspondence of Agassiz* (Boston, 1886); Marcou, *Life, Letters, and Works of Agassiz* (New York, 1896); Guyot, *Memoir of L. Agassiz* (Princeton, N. J., 1883), and Gilman and other eulogists, *Proceedings California Academy of Sciences*, vol. iv, 1873-74 (San Francisco, 1874).

AGASSIZ, MOUNT. An extinct volcano in Arizona, 70 miles northeast of Prescott and 10,000 feet above the sea level. Another peak of this name in Utah is 13,000 feet high.

AGATE (Lat. *achates*, Gk. *ἀχάτης*, *achatēs*, so named, according to Pliny (*Hist. Nat.*, xxxvii, 54), from the Sicilian river Achates, where it was first found). A variety of quartz (q.v.) composed of successive layers of silica deposited from a silica-saturated water solution. Slight amounts of impurities in the silica solution produce different colors in the agate, giving rise to banded agate in which the successive layers are of different color, clouded agate which has irregularly disposed patches of color, and moss agate which contains sharply defined, moss-like, dark markings due to manganese oxide. Agates are found universally and are much used, when cut and polished, for ornaments and jewelry. The principal supply comes from Uruguay and Brazil, in South America, whence they are sent to Oberstein, in Germany, where their polishing is an important industry.

AGATE SHELL, or AGATE SNAIL. Any land-snail of the genus *Achatina* (family *Achatinidæ*), of which many species are to be found throughout tropical Africa. They are carnivorous, tall-spined, usually tinted and banded in bright colors, and include the largest land-shells known, some being 10 inches long, producing eggs an inch in length, with a calcareous shell. See Plate of ABALONE, etc.

AGATHA, SAINT. According to the legend, a noble Sicilian virgin of great beauty and wealth, who rejected the love of the consul Quintianus, and suffered a cruel martyrdom in the persecution of Sicilian Christians. She holds a high rank among the saints of the Roman Catholic church. Her day falls on February 5. She is the patroness of the island of Malta, and there are churches erected in her honor. It is uncertain whether she ever lived, and if so, whether she died in the Decian persecution (251), or the Diocletian, 50 years later. Legend says that several times the mere carrying in procession of her veil, taken from her tomb in Catania, has averted eruptions from Mount Etna from the walls of that city, and that her intercession saved Malta from Turkish conquest in 1551. Consult A. Butler, *Lives of the Saints*, under February 5 (London, 1847).

AGATHARCHUS, äg'ä-thär'küs (Gk. *Ἀγαθάρχος*, *Agatharchos*). A Greek painter from Samos, who worked chiefly at Athens, between 455 and 415 B.C.; said to have been the first scenepainter in connection with a tragedy of Æschylus (q.v.), and therefore is of importance in the history of art through the development of perspective, in opposition to the school of Polygnotus

(q.v.). He is said by Vitruvius (q.v.) to have left a treatise on this subject.

AGATHARCIDES, äg'ä-thär'si-déz (Gk. *Ἀγαθάρκιδης*). A Greek historian and geographer, of Cnidus, who lived in the earlier half of the second century B.C. He wrote a work on the *Successors of Alexander the Great*, and a treatise, in five books, on *Europe, Asia, and the Red Sea*. From the latter treatise Photius (q.v.) gives extracts, at the same time praising the style of Agatharcides, as modeled on that of Thucydides. See Müller, *Fragmenta Historicorum Græcorum*; Bunbury, *History of Ancient Geography*, vol. ii (London, 1879).

AGA'THIAS (Gk. *Ἀγαθίας*) (530?-580?). A Greek poet and historian, surnamed Asianus. He was educated at Alexandria and Constantinople, studied Roman law and practiced it with success. He wrote love verses and made an anthology of earlier poets; but his most valuable work is a history of the years 552 to 558, intended to continue that of Procopius (q.v.), in which he tells of the overthrow of the Ostrogothic power in Italy by the Byzantines, of the earthquakes of 554 and 557, the beginning of the Greek and Persian war, the rebuilding of St. Sophia, etc. This work was edited by L. Dindorf in *Historici Græci Minores* (Leipzig, 1871). Consult Krumbacher, *Geschichte der byzantinischen Litteratur* (Munich, 1897).

AG'ATHO, SAINT. Pope from 678 to 681. He was more than 100 years old when he succeeded to the papacy. He was a native of Palermo, Sicily, and is remembered chiefly for his efforts in bringing about the Sixth Ecumenical Council, which assembled at Constantinople in 680 and condemned the Monothelite heresy. His festival is celebrated on February 20 by the Greek church, and on January 10 by the Roman church.

AGATHOCLES (Gk. *Ἀγαθοκλῆς*) (361-289 B.C.). A Sicilian despot, ruler of Syracuse. He was born at Thermæ, in Sicily; rose from humble circumstances through the patronage of Damas, a noble citizen of Syracuse, and received under him a command in the expedition against Agrigentum. Afterward he married the widow of Damas and became one of the most wealthy men in Syracuse. Under the rule of Sosistratus (q.v.) he was obliged to flee into Lower Italy, where he collected a band of partisans. Returning to Syracuse after the death of Sosistratus, he secured the supreme power in 317 B.C., strengthened his position by a massacre of several thousand respectable citizens, and took possession of the greater part of Sicily. To establish his power and keep his army employed, he now attempted to expel the Carthaginians from Sicily; but in this undertaking he was defeated. His next plan was to pass over to Africa with a part of his army and there to attack the Carthaginians. This war he carried on with success for more than three years, or until 307 B.C., when disturbances in Sicily compelled him to leave the army for a time. In 305, however, he triumphed completely over his foes in Sicily. He became one of the richest monarchs of the world, and formed an alliance by marriage with the Ptolemies in Egypt. He made raids upon Italy and in 299 conquered the Island of Corcyra. He had Greeks, Etruscans, Celts, and Ligurians in his army. He must have come into touch with the Romans, too; his biographer Kallias was among the first to concern himself much with Roman affairs. It was

his intention to leave the throne to his youngest son, Agathocles; but his grandson, Archagathus, made an insurrection and slew the royal heir. In revenge Agathocles restored the government to the people. He died 289 B.C.

AG'ATHON (Gk. 'Αγάθων) (447?–401? B.C.). An Athenian tragic poet. He gained his first victory at the Lenæan festival in 416 B.C.; this victory is celebrated in Plato's *Symposium*. He was well-to-do and had many friends, among whom were Euripides and Plato. He lived for some time at the court of Archelaus (q.v.) at Pella, in Macedonia. His style was flowery and ornate rather than strong or sublime, and his works were full of the rhetorical figures which marked the style of Gorgias (q.v.) and Prodicus (q.v.). Still, after Æschylus, Sophocles, and Euripides, he was the most important tragic poet of Greece. According to Aristotle, he began the practice of making the chorus songs mere interludes, disconnected in theme from the dialogue. He is ridiculed in Aristophanes' *Thesmophoriazusæ*. About 30 short fragments of Agathon are preserved.

AGATHON. A philosophical novel by Wieland (q.v.), published in 1766. Its hero (Agathon) is a Platonist, and the theme is the proper mean in human life between asceticism and sensuality.

AG'ATIZED WOOD. See CHALCEDONY; FOSSIL FORESTS.

AGAU, à-gou'. An Hamitic people of Abyssinia, supposed to represent the aboriginal inhabitants of the highlands. The Agau tribes are scattered in various parts of the kingdom, one district, in Amhara, southwest of Lake Tsana, being called Agaumed. The Agau language is widely diffused among the common people of Abyssinia.

AGAVE, à-gā'vê (Gk. fem. of ἀγᾶνός, *agauos*, noble, high-born), CENTURY PLANT. A genus of about 150 species belonging to the family Amaryllidaceæ and occurring in the arid and even desert regions of America. The most familiar species in cultivation is *Agave americana*, the 'American century plant'. The plants are characterized by the rosette of stiff, fleshy, and often spiny leaves on or near the ground, from the center of which arises a tall flower stalk (sometimes 20 feet high) bearing a large cluster of flowers. Many species are cultivated as ornamental, but in Mexico they are most useful plants. The leaves yield a coarse fibre used in the manufacture of thread, twine, rope, etc., while one species is the source of the well-known "sisal hemp," extensively used for cordage. The two best-known Mexican drinks, called "pulque" and "mescal," are obtained from several species of agave. Some of the species flower every year, others flower only occasionally, while some flower only once and die. The name "century plant" was given on account of an old fable that the species of agave, at least the cultivated *A. americana*, flowered only once in a century.

AGAVE. The mother of Pentheus (q.v.), whom, according to the Greek legend, she and other frenzied Bacchantes tore in pieces for opposing the new orgies of Dionysus. She was the daughter of Cadmus and the wife of Echion.

AGAWAM, äg'ä-wôm. A town in Hampden Co., Mass., 4 miles southwest of Springfield, on the Connecticut River, and the Central New England Railroad (Map: Massachusetts, B 3). It is situated in an agricultural region, producing tobacco, grain, potatoes and other

vegetables. The distilling of gin and the manufacture of woolen goods and paper are the principal industries. Agawam was settled in 1635 and was incorporated in 1854. It was the scene of some fighting during King Philip's War and Shays's Rebellion. Pop., 1900, 2536; 1910, 3501; 1913 (est.), 3900.

AGDE, ägd. An ancient French town in the department of Hérault, on the river Hérault, 2½ miles from the Mediterranean Sea (Map: France, S., H 5). To the north, under the walls of the town, flows the Languedoc Canal. Agde's commerce with Italy, Spain, and Africa has declined, and its chief activity is in coasting and fishing trade. The general aspect of Agde is sombre, on account of the black volcanic rock of which the houses are built and with which the streets are paved. Its most conspicuous building is the cathedral of St. Etienne, Agde having been the seat of a bishopric since the beginning of the Middle Ages. The town was founded by the Greeks of Massilia, and its first name was Agathe. Pop., 1896, 7007; 1901, 9533; 1906, 8435; 1911, 9265.

AGE. A term employed to designate successive epochs in the history of the human race, physiological stages in the growth of man, literary periods, etc. In the Greek mind the life of the race was likened to that of the individual—hence the infancy of the former might easily be imagined to be, like that of the latter, the most beautiful and serene of all. Hesiod mentions five ages—the Golden, simple and patriarchal; the Silver, voluptuous and godless; the Brazen, warlike, wild, and violent; the Heroic, an aspiration toward the better; the Iron, in which justice, piety, and faithfulness had vanished from the earth, the time in which Hesiod fancied that he himself lived. Ovid closely imitates the old Greek, except in one particular—he omits the Heroic Age. This idea, at first perhaps a mere poetic comparison, gradually worked its way into prose and finally became an element of scientific philosophy. These ages were regarded as the stages of the great world-year, which would be completed when the stars and planet had performed a revolution round the heaven, after which destiny would repeat itself in the same series of events. Thus mythology was brought into connection with astronomy. The Golden Age was said to be governed by Saturn; the Silver, by Jupiter; the Brazen, by Neptune, and the Iron, by Pluto. Many curious calculations were entered into by ancient writers to ascertain the length of the heavenly year and its various divisions. The greatest discrepancy prevailed, as might naturally be expected, some maintaining that it was 3000, and others as many as 18,000 solar years. The Sibylline Books compared it to the seasons of the solar year, calling the Golden Age the spring, etc.; and, on the completion of the cycle, the old order was renewed. The idea of a succession of ages is so natural that it has invrought itself into the religious convictions of almost all nations. It is sanctioned by Scripture, for it is symbolically adopted in the Apocalypse to a certain extent; it also manifests itself in the sacred books of the Hindus. Modern philosophy, at least in Germany and France, has also attempted to divide human history into definite ages or periods. Fichte numbers five, of which he conceives we are in the third; Hegel and Auguste Comte reckon three, placing us in the last. Modern anthropology divides the prehistoric period

man into the older and newer Stone Ages (Paleolithic and Neolithic) and the Bronze Age. Stone and bronze are here not figurative, as in Hesiod's classification, but are indications of the state of man's civilization. In reference to this and other ages, as defined in science, see GEOLOGY, etc. Physiologically, an age marks the span of human life, which is divided into five periods: *infancy* (the first 7 years), *childhood* (the next 7 years), *youth* (up to the 21st year), *adult life* (up to the 50th year), and *senility* (after the 50th year). Literature has had certain distinct ages. Thus, in English literature, we have had the Elizabethan Age, the Victorian Age, etc. History, too, recognizes certain large divisions in the political and social life of man. Hence we speak of the Dark or Middle Ages, the Modern Age, the Age of Steam, etc. The law of every land, too, recognizes certain ages in the growth from infancy to manhood or womanhood, and defines legal rights, duties, and responsibilities in accordance with such classification. Hence, "the age of consent," etc.

AGE. In law, that period of life at which persons emerging from infancy become capable of exercising the rights or become subject to the obligations and penalties of normal persons. As these rights and obligations vary greatly, the age of capacity may vary according to the right or obligation in question. Full age is the period at which a person acquires full legal capacity, and in England and the United States is usually fixed by law at 21 years, for men and women alike. This is considered to be attained on the day preceding the 21st anniversary of birth. In a few States, however, a woman comes of age at 18. Political capacity is usually coincident with the attainment of legal capacity, though greater maturity is usually required in this country of the holders of certain important offices of State. Thus, while one may become a member of the British Parliament at 21, no one can be a Representative in Congress until he is 25, or a Senator of the United States until he is 30, nor become President before attaining the age of 35. In short, full age, a male is 21, a female 18, and become capable of military service at 18 (military age), and become capable of consenting to marriage and the choice of a guardian at 14 (age of discretion). At common law the age of discretion for female infants was 12, and the age of consent to unlawful carnal intercourse was 10, but recent legislation in the United States has raised the age of consent to 14, 15, 16, and, in several States, including New York, to 18 years. (See CONSENT; RAPE.) The term "age of discretion" is also more commonly employed to designate the period (usually the age of 14) at which persons become subject to criminal liability, an infant under 7 years of age being deemed incapable of crime, and one between 7 and 14 being presumed to lack the discretion which such liability assumes; but this presumption is capable of being rebutted by proof. (See INFANT; CONTRACT; CRIME; MILITIA.) For the modern law of infancy, consult Schouler, *Treatise on the Domestic Relations* (Boston, 1870).

AGE, CANONICAL. The age which, according to the canons, a man must have reached for ination. This, in the Roman Catholic church, 2 for the sub-diaconate, 23 for the diaconate, or the priesthood, and 30 for the episcopate. Sensations may, however, be granted from rule. In the Greek church the age is 25 for a deacon, 30 for a priest or bishop; in the

Anglican communion, 23 for a deacon and 24 for a priest.

AGELADAS. See HAGELADAS.

AGEN, a'zhän'. The capital of the department of Lot-et-Garonne, France, situated in a fertile region on the right bank of the Garonne, 73 miles from Bordeaux (Map: France, S., E 4). The town is very ancient and was founded during the Roman occupation, when it was known as Aginnum. It was the capital of the Nittobriges, a Gallic tribe, was later an important city of the Agenois, and was the scene of bloody Huguenot executions. It is the seat of a bishopric, and the cathedral dates from the days of Clovis. Its public institutions include a seminary for the training of the clergy and a library. Standing between Bordeaux and Toulouse, Agen is a market for agricultural products and interchanges trade with both these places. It has, besides, several important home industries. The prunes of Agen are celebrated, and it manufactures other delicacies. Agen is the birthplace of Joseph Scaliger, Lacépède, and Bory de St. Vincent. Pop., 1901, 22,482; 1906, 23,141; 1911, 23,294.

AGENAIS, a'zhe-nā'. A former province of France which included almost the same territory now in the department of Lot-et-Garonne. In the fourth century this was the Civitas Agennensium, in Aquitania Secunda, whence its name. There is little of note in its history until 1152, when it was added to the territory of Henry II of England by his marriage with Eleanor of Aquitaine. In 1196 it formed a part of the dowry of Joan, sister of Richard the Lion-Hearted, when she married Raymond VI of Toulouse. With other lands of the county it was added to France in 1271, but was given back to the English ruler in 1279. In 1453, as a result of the Hundred Years' War (q.v.), it finally became a part of the French Kingdom. See AGEN.

AGENCE HAVAS, a'zhän' sa'va'. See HAVAS.

AGENDA (Lat. things to be done, from agere, to do). A term 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. Among writers of the ancient Church the term signified both divine service in general and the mass in particular. We meet with *agenda matutina* and *vespertina*, morning and evening prayers; *agenda diei*, the office of the day; *agenda mortuorum*, the service of the dead. It is also applied to Church books compiled by public authority, prescribing the order to be observed by the ministers and people in the ceremonies and observances of the Church. In this sense agenda occurs for the first time in a work of Johannes de Janua about 1287. The name was especially used to designate a book containing the formulæ of prayer and ceremonies to be observed by the priests in their several ecclesiastical functions. It was generally adopted by the Lutheran church of Germany, in which it is still in use, while in the Roman church it has been, since the sixteenth century, supplanted by the term "ritual" (q.v.).

AGENOR, a-jē'nôr (Gk. Ἀγήνωρ). Originally a mythical personage in the Argive legends, later said to have been a King in Phœnicia or Egypt, son of Poseidon, and father of Europa (q.v.), Cadmus, Phœnix, and Cilix. When Europa was carried off by Zeus, Agenor sent his sons in search, with orders not to return without their sister. As she was not found, Cadmus

founded Thebes, and the other sons settled in the countries which bore their names. See CADMUS.

A'GENT (Lat. *agens*, acting, pres. part. of *agere*, to act). A modern term in English law. As a generic term, it includes every one authorized to act for and represent another; but it is often used in a specific sense to denote one authorized to act for another in making contracts between that other, called the principal, and third persons. Blackstone does not employ it, and it rarely occurs in law dictionaries, digests, or decisions before the nineteenth century. For a time after its appearance it is used interchangeably with the word "servant." During the last century, however, the tendency of judges and law writers has been toward a complete differentiation of the terms "agent" and "servant." A fair illustration of the result is afforded by the following provisions of the California Civil Code: "An agent is one who represents another, called the principal, in dealings with third persons." "A servant is one who is employed to render personal service to his employer, otherwise than in the pursuit of an independent calling, and who in such service remains entirely under the control and direction of the latter, who is called his master." Using "agent," then, to denote a person authorized to act for and represent another in business transactions with third persons, and reserving the rules relating to *master and servant* (q.v.) for a separate article, let us consider, (1) how agency is constituted, (2) the liability of the principal to third parties, (3) the liability of the agent to third parties, (4) the liabilities of principal and agent to each other, (5) the termination of agency.

1. Ordinarily, the relation of principal and agent originates in a *contract* (q.v.) between the parties, but it may exist without a contract, as where A gratuitously undertakes to do an act for B. The relationship may rest upon ratification, instead of a precedent agreement. For example: A does an act avowedly as B's agent, without authority from B. The act does not bind B, unless he accepts it, as done on his behalf. If he does so accept it, his ratification is equivalent in law to a precedent appointment of A as agent. Even without appointing A or ratifying his acts, B may become liable for those acts, because his conduct induces third parties to believe that A is B's agent. In such a case there is agency by *estoppel* (q.v.). Still another form of agency is that which is created by the law, as where the law authorizes a wife to pledge her husband's credit for necessities. In the language of a learned judge, "the law creates a compulsory agency, and her request is his request."

2. A principal who has authorized an agent to do an act for him, or has ratified the act, is liable to third persons precisely as if the act had been done by him. As a rule, the principal is disclosed to the third party, and the latter understands that the transaction is between them, the agent being a mere conduit for the transmission of the principal's consent. But even though the principal is not disclosed, nay, even though the third party may refuse to enter into a transaction with the principal and may insist upon contracting with the agent as a principal, yet upon discovering that the transaction was for the principal's benefit and authorized by him, the third party may hold the principal liable. The principal may be liable to third

parties for his agent's acts which he has never authorized or which he has even forbidden. His liability in such cases depends upon whether the acts were done within the scope of the agent's apparent authority; for the principal will not be allowed to show that he secretly forbade what he appears to have authorized. What is the scope of an agent's authority depends upon the facts of the particular case, including ordinary business usages relating thereto. As the agent is, in law, a mere conduit of the principal's will, and thus identified with the principal, knowledge acquired by, or notice given to, the former during his agency, at least, is imputed to the latter. An exception to this rule exists where the agent acquires the knowledge or receives the notice in a transaction conducted by him in fraud of the principal. In such a case the agent cannot be expected to disclose his knowledge to the principal, and the legal fiction that the principal and agent are but one person will not be pressed so far as to work palpable injustice.

3. An agent who discloses his principal incurs no liability to third parties if his acts are authorized or ratified and are lawful. From liability for unlawful acts he cannot screen himself by proving an express command of his principal, although such command renders the latter liable also. Every wrongdoer is personally responsible for his misfeasance. An agent will render himself liable on a written contract under seal, or on a negotiable instrument, if he executes it in his own name, although he intends to bind his principal thereby. In order to bind the principal, such an instrument must be in his name and purport to be his deed, or note, or bill. In the case of other written contracts, the agent who discloses his principal will not be bound, unless the intention of the parties that he should be bound is apparent from the writing and attendant circumstances. The agent may render himself liable to the third party by assuming to act for a principal without authority.

4. In the absence of express stipulations in the contract to the contrary, the principal is under obligation to compensate the agent for his services; to reimburse him for all proper expenditures on the principal's behalf and to indemnify him against the consequences of authorized acts which he did not know, or which he was not bound to know, were unlawful. On the other hand, the agent is under obligation to act with the utmost good faith toward the principal, obeying his instructions, advancing his interests, and rendering full and true accounts of all transactions. An agent cannot delegate his authority to another, so as to escape responsibility to the principal for that other's acts, without the express or implied assent of the principal. Nor, ordinarily, will a principal be bound by the acts of a sub-agent whose employment he has not authorized or ratified.

5. Agency may be terminated by the agreement of the parties, or by the principal's revocation of the appointment, or by operation of law. If terminated in either of the first two ways, notice must be given to those who have been accustomed to deal with the agent, or the latter will still be able to subject the principal to liability to such persons; for, until notice of revocation, these have a right to suppose that the relation of principal and agent continues. The death of either principal or agent, and the

bankruptcy of the principal, furnish the most common examples of termination of agency by operation of law, and such termination is effective without notice. An agency which is "coupled with an interest" (i.e., a vested property right) in the subject-matter of the agency is revocable only by the mutual assent of both parties.

Doctrines peculiar to special classes of agents are dealt with under the appropriate headings, e.g., ATTORNEY; AUCTION; BROKER; PARTNERSHIP; FACTOR; CRIME. Consult: Evans, *Principal and Agent in Contract and Torts* (2d ed., London, 1888); Huffcut, *Law of Agency* (Boston, 1901); Story, *Commentaries on the Law of Agency* (9th ed., Boston, 1882).

AGE OF INNOCENCE. A celebrated painting by Sir Joshua Reynolds in the National Gallery, London. It depicts a little girl sitting on the ground before a group of trees.

AGE OF REASON. The name given to a certain phase and period of the French Revolution when Christianity was decried, Reason proclaimed as the only true deity, and bishops exchanged their mitres for liberty caps. This movement was fomented by Hébert (q.v.) and his followers, professed atheists, who succeeded in persuading many Christians to renounce their faith. The worship of Reason centred around the ceremonies held in her honor at Notre Dame, Nov. 10, 1793. The Goddess of Reason, typified by a beautiful actress, was placed on the altar and received the homage of her adorers. A schism in the party of the Montagnards, to which the atheists belonged, led to their execution, March 24, 1794. It was not, however, till June 8, 1794, that France, in the Feast of the Supreme Being, again received officially religion, at the hands of Maximilien Robespierre. Consult Aulard, *Le culte de la Raison et le Culte de l'Être Suprême* (Paris, 1892).

AGĒSAN'DER (Gk. Ἀγήσανδρος, *Agēsandros*). A Greek artist of the school of Rhodes who lived in the first century B.C. In conjunction with Athenodorus and Polydorus he executed the celebrated group of Laocoön, which was discovered near the baths of Titus in the sixteenth century. See LAOCOÖN.

AGES'ILAN OF COLCHOS, kōl'kōs. The title and hero of one of the romances in *Amadis of Gaul* (q.v.), books xi and xii.

AGES'ILA'US (Gk. Ἀγησίλαος, *Agēsilaos*) (c.444-360 B.C.). The name of several kings of Sparta, of whom the most important was King about 401-360 B.C. He was the son of Archidamus II and succeeded Agis II, Leotychides, the son of Agis, being set aside through the influence of Lysander (q.v.), on the ground of illegitimate birth. (See AGIS, 2.) In 397 B.C. he was sent to Asia Minor as commander-in-chief of the Spartan forces in the war with Persia, which arose out of the expedition of the 10,000 Greeks with Cyrus the Younger (q.v.). He carried on the war with success and was preparing to advance into the interior of Persia, when in 394 B.C. he was called back to Greece to make head against the coalition which had been formed by Thebes, Athens, and other Grecian States against the power of Sparta. Proceeding by land, he arrived in Greece about a month later and in the same year defeated the allies at Coronea, in Bœotia. In the years that followed, Agesilaus took an important part in his country's politics and

campaigns. In 361 B.C. he undertook an expedition to Egypt, but while on his way home died, in the winter of 361-360. Agesilaus was small of stature and lame. He was simple in dress and in his way of living; blameless in public and private life alike; a patriot, though a party man; a conservative in politics; a successful, though not a great, general. Biographies of Agesilaus were written by Xenophon and Plutarch.

AGGLOM'ERATE. In geology the name applied to a consolidated mass of fragmental volcanic materials, chiefly bombs and rough blocks of lava that fall close to or within the cone. The fragments are of all sizes, the larger reaching several feet in diameter and tons in weight, and lack the sorted or stratified arrangement characteristic of sedimentary rocks, but lie haphazard just as they fell. The spaces between the blocks are generally filled with volcanic ash, which with the action of the atmosphere and of infiltrating waters forms a cement that renders the mass compact and solid. Although the material in an agglomerate chiefly consists of some volcanic rock, like basalt, porphyry, or felsite, scattered pieces of sedimentary nature, such as limestone or sandstone, may occur, these having been torn off from the sides of the chimney in the course of an eruption. Except in very violent outbursts the blocks of lava are not carried any considerable distance away from the vent; for the most part they return to the crater. The finer sizes that range from gravel to dust-like particles and that may be transported many miles from the source form a deposit known as volcanic tuff. There is, of course, no sharp distinction to be made between the two kinds, as they are connected by deposits of intermediate character. When the volcanic fragments have been sorted by water and their angles rounded off by abrasion before their final deposition, the rock is called a volcanic conglomerate. Agglomerates have been described from the very early geological formations, as well as those of recent date. In whatever situation they are found they afford conclusive evidence of local volcanic activity and frequently mark its actual centre. See VOLCANOES.

AGGLU'TINATE LAN'GUAGES (Lat. *ad*, to + *gluten*, glue, paste). One of the chief linguistic groups, characterized by postpositional elements added to roots. These suffixes, ultimately losing their distinct meanings, become integral components of the words, thus forming the transition to inflection (q.v.). Hence, these languages are very numerous, and, for lack of more accurate knowledge, are grouped as yet very loosely. The chief families of agglutinate languages are Ural-Altaic (including Finnish, Turkish, and Hungarian), Dravidian (spoken in southern India), Tibeto-Burman (in Tibet, Siam, and Burma), and Malayo-Polynesian. Consult Friedrich Müller, *Grundriss der Sprachwissenschaft* (4 vols., Vienna, 1876-88). See PHILOLOGY; TURANIAN LANGUAGES.

AG'GREGA'TION, STATES OF (Lat. *ad*, to + *gregare*, to collect into a flock). The three states, *gaseous*, *liquid*, and *solid*, in which matter occurs. Many substances are capable, under certain conditions of temperature and pressure, of existing in any of the three states. Water, for instance, may be gaseous (steam, or water vapor), liquid (as ordinarily), or solid (ice). Other substances, on the contrary, could, by the means at our disposal, be obtained in

only one of the states of aggregation; thus, the element carbon remains solid even at the highest temperatures that can be produced at present, and many of its compounds undergo chemical decomposition before reaching the point at which they might melt.

Under certain conditions matter has been assumed to be capable of existing in other states besides the above three. Thus, Boutigny thought that liquids, when thrown upon glowing hot surfaces, pass into what he called the *spheroidal* state. Crookes thought that, at the instant of the electric discharge, the gases inclosed within a Crookes tube pass into a *radiant* state, which is characterized by certain properties not found in the other states of aggregation. When under the critical pressure and temperature (see CRITICAL POINT), substances are sometimes said to be in the *critical* state. In this article, however, only the three states of aggregation that are generally recognized may be briefly characterized.

1. A gas (or vapor) occupies the volume and assumes the shape of the vessel within which it is inclosed, and its resistance to a change of shape is very small. The amount of work which must ordinarily be expended in diminishing the volume of a gas is also insignificant compared to that required in the case of liquids or solids. Another characteristic property of gases is their capacity of mixing with one another in all proportions. Gases may be said to be matter in a highly rarefied state, their specific gravity being ordinarily very small compared to that of liquids or of solids. According to the molecular theory, the distances between their particles are very great, and therefore the particles exert very little action upon one another. See MOLECULES—MOLECULAR WEIGHTS.

2. The volume of a liquid varies but little with the external conditions; comparatively great pressures, for instance, will cause but a slight diminution of the volume of a liquid. Like gases, however, liquids have no shape of their own, and they readily assume the shape of the vessel containing them. Certain pairs of liquids (for instance, alcohol and water) are capable, like gases, of mixing in all proportions; others (for instance, carbolic acid and water) dissolve in each other to a limited extent; still others (for instance, carbon di-sulphide and water) are practically insoluble in each other. The molecules of a body in the liquid state are much nearer to one another than those of a gas, and consequently are capable of exerting upon one another considerable attraction. In an overwhelming majority of cases liquids are isotropic and have no effect on the plane of polarized light. But substances in the so-called liquid crystalline state, though incapable of assuming a definite shape like solids, act like crystals when introduced between two "crossed" Nicol's prisms and cause light to pass through the prisms. In memoirs published in 1908 and 1909 Bose made an interesting attempt to explain this peculiar state of substances, on the assumption that the molecules arrange themselves in parallel layers. In 1910 Nernst published a thermodynamic study corroborating this view. See LIQUID CRYSTALS.

3. In the case of solids, not only the volume, but also the shape, cannot be easily changed. Very little is as yet known of the molecular constitution of solids. In recent years the distinction between the metallic and non-metallic states has attracted considerable thought.

Metals are characterized by their opaqueness, their complete insolubility in non-metallic solvents, and their extraordinary electrical conductivity. Attempts have been made to explain the conductivity both of pure metals and alloys on the basis of the electron theory. Concerning the mutual solubility of solids, see SOLUTIONS and ISOMORPHISM.

Consult: J. D. van der Waals, *La continuité des états gazeux et liquides* (Paris, 1894; Leipzig, 1899–1900); Ruer, *Metallographie* (Hamburg, 1907); Freundlich, *Kapillarehemie* (Leipzig, 1909); K. Hack, *Das Wesen der Aggregatzustände. Stadtprozelten* (1912). See COLLOID.

AGG'TELEK. See AGTELEK.

AGH'LABIDS. A Moslem dynasty in Kairawan (q.v.). It was founded by Ibrahim ibn al Aghlab in 800 A.D. and was overthrown by the Fatimids in 909. The 11 rulers assumed only the title Emir, and nominally recognized the Abbasid Caliphate, but practically were independent. The hereditary rights were granted by Harun al Rashid. Their territory included all of Ifrikiya, or the ancient *provincia Africa*. In 827 Ziyadat Allah began the conquest of Sicily which was continued by his successors. See the edition and translation by Noël des Vergers of Ibn Kbaldu'n's *Ibar IV*, under the title *Histoire de l'Afrique sous les Aghlabites et de la Sicile* (1891); Amari, *Storia dei Musulmani di Sicilia* (1854); *Bibliotheca Arabo-Sicula* (1857).

A'GIAS (Gk. 'Αγίας). An ancient Greek cyclic poet of Træzen, who lived about 740 B.C. His chief work was *Νοστοί*, *Nostoi*, or the *History of the Return of the Achæan Heroes from Troy*. Only fragments of the poem have been preserved. Consult F. C. Welcker, *Der epische Cyklus* (Bonn, 1849); D. B. Monro's edition of the *Odyssey*, books xiii–xxiv, pp. 378 ff. See CYCLIC POETS.

AGIB, ā'gib. The name of two characters in the *Arabian Nights*. 1. In the *History of the Three Calendars*, the third calendar, whose marvelous adventures began with his shipwreck on the lode-stone mountain. 2. In *The Story of Noureddin Ali and Bedreddin Hassan*, the son of the latter.

AGINCOURT, à'zhān'kōōr', Eng. pron. āj'-in-kort, or **AZINCOURT**. A village in the department of Pas-de-Calais, France, celebrated for the splendid victory over the French gained by Henry V of England on St. Crispin's Day, Oct. 25, 1415. Reviving the ancient claim of the Plantagenets to the French throne, Henry had invaded France and taken Harfleur; but disease and privations in his small army determined him to return to England for reinforcements. Setting out for Calais, he forded the Somme with great difficulty, only to find a French army of about 50,000 men blocking his way. Henry offered advantageous terms, to save his 14,000 men from destruction; but the French were so confident of annihilating the weakened English troops that they would hear of nothing but absolute surrender. Between two woods, near the villages of Agincourt and Tramecourt, the English placed themselves in sullen desperation. The French, mainly Armagnac soldiery and men-at-arms, were drawn up in two lines, cavalry in front, infantry behind. As the English marched forward, the enemy's cavalry, peers and knights of France, charged to meet them. But the loamy ground held their horses' feet, and the rain of English cloth-yard arrows poured upon

rider and horse, broke the front rank, which in confusion retreated on the second line, breaking that too. The English archers, with billhook and hatchet, dashed in among the heavily encumbered men-at-arms and slaughtered them in great numbers, turning the fighting into a butchery. Those of the enemy who could, ran; the rest perished. The French nobility was almost annihilated in this battle; among the 5000 of noble birth being the Constable d'Albret, the commander of the French force, three dukes and very many lords and knights of lesser degree. The English lost very few men, but among them the Duke of York. It is stated that only 13 men-at-arms and about 100 foot-soldiers fell on the English side. Consult Nicolas, *History of the Battle of Agincourt* (London, 1833).

AGIO, äj'i-ò or ä'ji-ò. An Italian word, signifying 'accommodation,' first used in Italy to denote the premium taken by money-changers in giving gold for silver, on account of the greater convenience of gold for transport. The same word is now used in particular to denote the difference in the value of a metallic currency and the paper money representing it; also the variations from fixed parts or rates of exchange. It corresponds very nearly to the English word "premium."

AGIRA, ä-jë'rà, formerly SAN FILIPO D'ARGIRÒ. An ancient city in Sicily, 2130 feet above the sea and 45 miles northwest of Catania (Map: Italy, J 10). The historian Diodorus (q.v.), who was born here, credits it with having been honored by a visit from Hercules, but St. Philip has succeeded the heathen hero as the tutelary genius of the city. To the north is Gagliano, where 300 French knights were ambushed in 1300. The whole vicinity is famous for its fine marble. Pop., 1901, 17,738; 1911, 21,877.

A'GIS (Gk. ἄγῖς). The name of several kings of Sparta. 1. Son of Eurysthenes and founder of the family of the Agidæ. According to one account, he conquered Helos and established the order of the Helots. (See HELOS; HELOTS.) 2. Son of Archidamus II, and King from 427 or 426 to 401 B.C. He was one of the best kings of Sparta and one of the most distinguished men of his time. He took an active part in the Peloponnesian War, several times invaded Attica, and defeated the Athenians and their allies at the battle of Mantinea (q.v.), in 418 B.C. It was said that Alcibiades seduced Timæa, the wife of Agis; in consequence of this report, in reality incredible, Leotychides, Timæa's son, was excluded from the throne in favor of Agesilaus (q.v.). 3. Son of Archidamus III, and King from 338 to 331 B.C. He tried to overthrow the Macedonian power in Europe while Alexander the Great was in Asia, but was defeated and killed in battle by Antipater in 331 B.C. 4. Son of Eudamidas II, and King from 244 to 240 B.C. He tried to re-establish the institutions of Lycurgus and reform the Spartan State, but, being opposed by the wealthy classes, was thrown into prison and put to death. Consult Plutarch, *Life of Agis* and Barran, *Histoire d'Agis IV* (Paris, 1817).

AGIST'MENT (OF. *agister*, Lat. *ad*, to + OF. *gister*, to assign a lodging, from *giste*, Fr. *gîte*, an abode, resting-place). The common contract of bailment (q.v.), whereby a person (called the *agister*) pastures the horses, cattle, or sheep of another. The *agister* is not subject to the extraordinary liability of the common

carrier (q.v.) and the inn-keeper (q.v.) for the loss of the property intrusted to his care, but is, nevertheless, bound, as an ordinary bailee for hire, to take reasonable care of the animals. On the other hand, he is not, like the inn-keeper, the common carrier, the horse-trainer, etc., entitled to a lien (q.v.) at common law on the animals for his charges. Now, however, he has such a lien by statute. Consult: Sir William Jones, *Essay on the Law of Bailments* (New York, 1828); Story, *Commentaries on the Law of Bailments* (Boston, 1878).

AGLA'IA (Gk. Ἀγλαία, splendor, beauty). According to Hesiod, the youngest of the three Graces (q.v.), the wife of Hephæstus.

AGLA'OPHON (Gk. Ἀγλαοφῶν). A famous Greek painter from Thasos, who lived about 500 B.C. He was the father of Polygnotus (q.v.) and Aristophon, also painters and his pupils. Quintilian (12, 10, 3) warmly praises Aglaophon's pictures for simplicity of coloring.

AGLAR, ä-glär'. See AQUILEJA.

AGLAU'RA. A play by Sir John Suckling (q.v.), produced in 1637-38, and first published in 1638, in folio, and again in 1646. It is said that the King was present when the play was acted and was so distressed by its sad ending that the author wrote a new conclusion, making the piece a "tragi-comedy."

AGLIARDI, ä-lyär'dë, ANTONIO (1832-1915). Chancellor of the Holy Catholic Church, Bishop of Albano, and Cardinal. He was born at Cologno and studied law and theology at Rome. He was sent to Canada as a Bishop, and after his return in 1884 Pope Leo XIII appointed him Archbishop of Cæsarea in Palestine, and shortly thereafter he was sent as the apostolical delegate to India to settle the Goa controversy with Portugal. In 1889 he was the Papal Nuncio in Munich, and four years later filled the same position in Vienna. His personal interference with the ecclesiastical affairs of Hungary, in 1895, resulted in his receiving a public reprimand from the Hungarian government, in consequence of which a dispute arose between Bánffy, the President of the Hungarian Ministry, and Kálnoky, the Austro-Hungarian Minister of Foreign Affairs, which culminated in the downfall of the latter. He was created and proclaimed a Cardinal in 1896.

AGLOSSA, ä-glös'ä (Gk. ἄ, *a*, priv. + γλῶσσα, *glōssa*, tongue). A sub-order of anurous amphibia, the frogs, without a tongue and with one pharyngeal opening of the Eustachian tubes. It contains certain fossil forms, but only two recent families—Pipidæ (South American) and Xenopidæ (African). See PIPA.

AGNANO, ä-n-yä'nò. Formerly a small lake near Naples, Italy, situated in the crater of a volcano, now drained on account of its malarial influence. At the southern entrance to Lake Agnano lies the Grotto del Cane, whose floor is covered with a stratum of carbonic acid gas of sufficient strength and depth to kill small animals that are put into the grotto. Nearby are situated the vapor baths of San Germano, used by people afflicted with rheumatism and gout. The volcanoes surrounding the lake have been extinct since 1198 A.D. Immediately to the northwest of Agnano lies the lake of Astroni, which occupies the crater of an extinct volcano and is surrounded by beautiful woodlands.

AG'NATE (Lat. *agnatus*, born in addition to, from *ad*, to + *natus*, born). Agnates, in the law of both England and Scotland, are persons

related through the father, as cognates are persons related through their mother. By the English law of succession, agnates inherit unless the inheritance was received by the deceased person *a parte materna*, i.e., from the mother, or a cognate, in which case it would descend, if he left no issue, to her cognates. In the Roman law both of these terms had a somewhat different signification. Agnates, by that system, were persons related through males only, whilst cognates were all those in whose connection, though on the father's side, one or more female links intervened. Thus, a brother's son was his uncle's agnate, because the propinquity was wholly by males; a sister's son was his cognate, because a female was interposed in that relationship. The reason for having thus changed the meaning of terms manifestly borrowed from the Roman law seems to be that in Rome the distinction between agnates and cognates was founded on an institution which has not been adopted in the Roman sense by any modern nation—that, namely, of the *patria potestas* (q.v.). Roman *agnati* are defined by Hugo to be all those who either actually were under the same *paterfamilias*, or would have been so had he been alive; and thus it was that, as no one could belong to two different families at the same time, the agnation to the original family was destroyed and a new agnation created, not only by marriage, but by adoption (q.v.).

Justinian abolished entirely the distinction between agnates and cognates and admitted both to legal succession. As to the legal effects of the distinction in the modern sense, see SUCCESSION; GUARDIAN. See the works referred to under CIVIL LAW.

AGNES (*Fr. pron.* ān'yēs'). 1. In Molière's *L'École des femmes*, a character who has become proverbial as a type of the *ingénue*. She is a young girl brought up in ignorance of many of the social relations, who innocently makes the most suggestive remarks and without intention cruelly wounds other people's feelings. In English, Wycherley's *Mrs. Pinchwife* is in some respects patterned after her. 2. A character in Lillo's tragedy, *Fatal Curiosity*. 3. Agnes Wickfield, in Dickens's *David Copperfield*. See WICKFIELD, AGNES.

AGNES, SAINT. A Christian virgin, martyred in Rome by order of Diocletian when about 13 years old. The legend is that her beauty excited the desires of wealthy suitors, who, vainly seeking her in honorable marriage, denounced her to the governor as a Christian. Unmoved, she heard threats of torture and was sent to the public brothel, where only one, however, ventured to touch her, and he was stricken with miraculous blindness until his sight was restored in answer to her prayers. She was a little later beheaded. Her day is January 21, and her symbol is a lamb. Her legend resembles that of St. Agatha (q.v.). Consult A. Butler, *Lives of the Saints*, under January 21 (London, 1847).

AGNES GREY. A novel by Anne Brontë, published 1847, under her pseudonym of Acton Bell.

AGNESI, ān-yā'zē, MARIA GAETANA (1718-99). An Italian mathematician, born at Milan. Her family was prominent at Milan, and she had all the educational advantages that wealth could procure. Her linguistic and philosophic powers suggested the title of "oracle in seven languages." She also gave much attention to the

sciences, particularly to mathematics. "Algebra and geometry," she said, "are the only provinces of thought where peace reigns." In 1748 she was made a member of the Academy of Bologna, and in the same year appeared her *Istituzioni analitiche ad uso della gioventù italiana* (2 vols., Milan, 1748; Paris, 1775; London, 1801). In 1750 she was appointed by Pope Benedict XIV lecturer on mathematics at the University of Bologna. Early devoted to religious observances, after the death of her father (1752), she renounced her scientific work and took the veil. Her name is connected with an interesting cubic curve. Consult J. Boyer, "La mathématicienne Agnesi," in the *Revue Catholique des revues françaises et étrangères* (Paris, 1897), and Antonio Francesco Frisi, *Elogio* (Milan, 1799; translated by Boulard, Paris, 1807).

AGNES OF AUSTRIA (1281-1364). A daughter of Albrecht I, Emperor of Germany. She was the wife of Andreas III, King of Hungary, and after the murder of her father (1308) lived at the monastery of Königsfelden, which her mother had erected upon the site of the assassination of the Emperor. She took an active part in the political events of the period and frequently acted as mediator between Austria and the Swiss Confederacy. See Liebenau, *Lebensgeschichte der Königin Agnes von Ungarn* (Regensburg, 1868).

AGNES OF MERAN, mā-rän' (?-1201). A Queen of France, daughter of the Duke of Meran (Tyrol). She was married in 1196 to Philip Augustus (q.v.), who had obtained (through the French bishops) a divorce from Ingeborg of Denmark. The Pope refused to allow the divorce, but the King braved the Papal wrath. In 1200 France was placed under an interdict; but the King, by a feigned compliance, secured the raising of the interdict. Agnes died in 1201, but it was not until 1213 that Philip was reconciled to Ingeborg. Then the Pope legitimized the two children of Agnes.

AGNES OF POITIERS, pwä'tyā' (1025?-1077). A Queen of Germany, daughter of William V, Duke of Aquitaine, and second wife of Henry III of Germany, to whom she was married in 1043. She was much influenced by the ideas of Cluny. After the death of Henry (1056), Agnes became Regent of the Empire as guardian of her son, Henry IV. In 1062 rebellious nobles secured possession of the young Henry, and Agnes went to Italy. She became closely associated with Gregory VII in his contest against Henry.

AGNES'S EVE, SAINT. The night of January 20. In popular superstition it is regarded as an occasion when young women can by various magic arts behold the faces of their destined husbands.

"The Eve of St. Agnes" is the title of an exquisite poem by Keats.

AGNES SOREL' (c.1422-50). The mistress of Charles VII of France from 1444 until her death. She was the first royal mistress in France to receive public recognition as an acknowledged power in the kingdom. She received many gifts and honors and aroused much scandal. Her death was sudden, and it was supposed that she was poisoned by the Dauphin, afterward Louis XI. She had four children by the King. Many legends gathered about her name, and credit was erroneously given her for aiding Joan of Arc in her work. She has been popularly regarded as a virtuous character, using her influence for

good. There is a beautiful monument to her in the church at Loches. See Duquesne, *Vie et Aventures galantes de la belle Sorel* (Paris, 1909).

AGNEW, CORNELIUS REA (1830-88). An American physician. He was born in New York City, and graduated from Columbia College in 1849, and from the College of Physicians and Surgeons in 1852. In 1858 he was appointed surgeon-general of New York State, and during the Civil War was medical director of the New York Volunteer Hospital. He was prominent in the United States Sanitary Commission. He assisted in founding the Columbia School of Mines in 1884, founded the Brooklyn Eye and Ear Hospital in 1868, and the Manhattan Eye and Ear Hospital in 1869.

AGNEW, DAVID HAYES (1818-92). Professor of surgery at the University of Pennsylvania and very widely known by his surgical inventions and by his writings, among which is *The Principles and Practice of Surgery* (3 vols., 1878-83). He was one of the surgeons who attended President Garfield when he was shot.

AGNEW, SIR WILLIAM (1825-1910). An English publisher and publicist. He was born in Manchester and was educated privately in that city. His father, Thomas Agnew, was a printer, with large establishments in Manchester, Liverpool, and London. William Agnew entered the firm and eventually became senior member, a position which he held for many years, the firm name, however, remaining Bradbury, Agnew & Co. Among the publications of this house is *Punch*, the great English humorous weekly. William Agnew was for many years a warm friend and supporter of Gladstone. In 1880 he was elected to Parliament as a Liberal from a Lancaster division. He was reelected five years later, but retired from politics in 1892, after a defeat for reelection. He was a prominent figure in the publishing and art world of his day, and in public activities became known as chairman of the Art Committee of the Manchester Exposition (1887); member of the Royal Commission for the Melbourne Centenary Exposition; and member for the Paris Exposition of 1892. He printed a volume of essays, addresses, and travel notes, which had a private circulation.

AGNI, äg'nê (Skr. *Agni-s*). The fire god of the Hindus, corresponding in name to the Latin *ignis*, Lithuanian *ugnīs*, and Old Slavic *ognī*, fire. Next to Indra (q.v.), he is the most prominent of the gods in the *Veda* (q.v.). No less than 200 hymns celebrate his praise under his three-fold form, as the fire on earth, especially the altar-fire, the lightning in the sky, and the sun in heaven. His birth is of divine origin, as the lightning of the clouds, or he is daily produced by a miracle, the rubbing together of two sticks which are regarded as his parents, and he devours them as soon as he is born. Kindled each morning at the sacrifice, his worship forms one of the most important parts of the ritual. He is especially the messenger between the gods and men, and he rides upon a chariot drawn by two or more steeds. Although an immortal, he has taken up his abode among men, and he is regarded as the most honored guest. He is also the flame of the sacrifice offered by the gods themselves to maintain their sovereignty and assure the persistence of the supreme laws of the universe. In the later literature less is

made, perhaps, of Agni than in the early hymns; but, as one of the most prominent gods, several legends are preserved regarding him in the Hindu epics *Mahābhārata* and *Rāmāyana* (q.v.). The *Harivaṅśa* (q.v.) describes him as clad in black, with a banner of smoke and a javelin of flame. In pictures he is variously portrayed, but his color is red, and he is represented as having two faces, which typify his destructive as well as his beneficent character, and he has three legs and seven arms. Sometimes he is represented as riding upon a ram or as accompanied by that animal. Consult: Macdonell, *Vedic Mythology* (Strassburg, 1897); Hopkins, *Religions of India* (Boston, 1895); Wilkins, *Hindu Mythology* (London, 1900).

AGNO, äg'nō. The second river of importance in the island of Luzon, Philippines, rising near the boundary of the provinces of Banguet and Lepanto. It is about 128 miles long and because of the irregularity of the country through which it flows receives a great many tributaries throughout the lower part of its course. It empties into the Gulf of Lingayen.

AGNOETÆ, äg'nō-ē'tē (Gk. *ἀγνοεῖν*, *agnoein*, to be ignorant). A Monophysite sect in the sixth century, which gave prominence to the statement that, in his human nature, Christ was ignorant of many things, especially of the time of the day of judgment. An Arian sect of the same name in the fourth century denied the omniscience of God.

AGNOLO, dän'yō-lō, BACCIO D'. See BAGLIONI.

AGNOLO. See AGOSTINO.

AGNO'MEN (Lat. *ad*, to, in addition + *nomen*, name). A term used by the ancient Roman grammarians of the fourth century A.D. to denote an additional personal name derived from some exploit, personal characteristic, or important event; as *Cunctator*, 'the Delayer,' given to Q. Fabius Maximus because of his policy of delay in the war against Hannibal. Compare also Pompeius *Magnus*; Æmilius *Macedonicus* (see PAULUS ÆMILIUS). The Romans of an earlier time apparently regarded such a designation as an additional *cognomen* (q.v.). The *cognomen* was inherited or bestowed at birth, and belonged to all members of a *familia*; the *agnomen* was a name won later by an individual.

AGNONE, äñ-yō'nā. A city of south Italy, 22 miles northwest of Campobasso (Map: Italy, J 6). It stands on a hill said to be the site of the Samnite *Aquilonia*. There are sulphur and mineral springs and copper mines in the neighborhood, and the town has cloth, steel, and copper works. Pop., 1901, 9793; 1911, 10,106.

AGNOSTICISM (Gk. *ἀγνωστος*, *agnōstos*, unknown, unknowable, ignorant). A word coined in 1869 by Professor Huxley to express the doctrine that man from his very nature is incapable of forming trustworthy conclusions concerning ultimate reality. The doctrine is by no means new. It is essentially one with the view of Protagoras (q.v.), that the individual man is the measure of the universe, and with the view of the Greek skeptics from Pyrrho onward. (See ÆNESIDEMUS.) Among English-speaking philosophers H. Spencer (q.v.) is the best-known agnostic. The tenability of the agnostic position depends on the justifiability of the dualistic assumption that reality is independent of mind. It argues that knowledge is the result of a mental process which claims to represent an external

reality; that the knowledge that this claim is valid is possible only after a comparison of the representation with the original; but that the original is, by hypothesis, not an object of knowledge; hence, that no comparison is possible for the knower. Knowledge of reality is thus a huge undemonstrable assumption. Consult Sir Leslie Stephen, *An Agnostic's Apology* (New York, 1903) and W. U. Moore, *Glimpses of the Next State* (London, 1911). For a criticism of agnosticism see KNOWLEDGE, THEORY OF; ABSOLUTE; DUALISM; APPEARANCE.

AGNOS'TUS (Gk. *ἄγνωστος*, *agnōstos*, unknown). A characteristic Cambrian genus of blind trilobites distinguished by their small size, the elliptical form of the dorsal shield of carapace, the close resemblance of the head-shield (cephalon) and tail-shield (pygidium), and the presence of only two segments in the thorax. This genus, comprising over 150 species, is abundantly represented in the Cambrian formations of Scandinavia, Bohemia, Great Britain, Spain, and North America; indeed, certain kinds of Cambrian shales are filled with the detached fragments of the discarded moults of these crustaceans. A few species are, in northern Europe, known from the lowermost Ordovician beds. An allied genus, also characteristic of the Cambrian formations, is *Microdiscus*, with four thoracic segments, which seems to be a somewhat earlier form than *Agnostus* and may perhaps be in a certain sense the ancestral form from which *Agnostus* was evolved. For illustration, see TRILOBITA. See also articles on TRILOBITA; CAMBRIAN SYSTEM.

AG'NUS, FELIX (1839—). An American soldier and editor. He was born in Lyons, France, and fought in the war waged by Napoleon III against Austria, and after the battle of Montebello was detailed to the celebrated flying corps under Garibaldi. He came to America in 1860, and enlisted in the Duryea Zouaves (New York Volunteers), upon the outbreak of the Civil War, and at the battle of Big Bethel saved the life of General Kilpatrick. He served as lieutenant-colonel under Sheridan in the latter's famous campaign in the Shenandoah valley (1864), and toward the close of the war, as inspector-general in the Southern Department, he was commissioned to dismantle the Confederate forts in South Carolina, Georgia, and Florida. At the close of the war he was brevetted brigadier-general of volunteers (March 13, 1865), and soon afterward was retired from the service. He then became business manager, and later editor and publisher, of the *Baltimore American*.

AG'NUS DE'I (Lat. Lamb of God). One of the titles of Christ (John i. 29); also the name given to a certain prayer used in the Roman Catholic service of mass. The litanies generally conclude with the same prayer: "O Lamb of God, that takest away the sins of the world, have mercy upon us." The figure of a lamb bearing a cross, stamped upon an oval of wax, silver, or gold, is also styled an *Agnus Dei*. Such medals have been consecrated by the popes since the fourteenth century, and are generally distributed among the faithful on the first Sunday after Easter. In the ancient Church candidates for baptism received similar medals of wax and wore them as objects of devotion. In the Greek church the cloth which covers the cup in the communion service bears the image of a lamb and is styled the *Agnus Dei*.

AGOG'ICS. A musical term denoting the subtle modifications of tempo inseparable from an expressive interpretation. The term was first introduced by H. Riemann (q.v.) in his *Musikalische Dynamik und Agogik* (1884). The author shows that all dynamic variations affect the strict time-value of accented notes, so that in a crescendo the performer almost unconsciously prolongs the actual value of every accented note, whereas in a diminuendo the time-value is lessened.

AGONA'LIA. A Roman Festival. See FESTIVALS.

AGON'IC LINES (lines without angles, from Gk. *ἀ*, *a*, priv. + *γωνία*, *gōnia*, angle). Imaginary lines on the surface of the earth such that at each point through which one passes the magnetic declination is zero; that is, at such a point a magnetic compass needle lies in the geographical meridian and hence points in a "true" north and south direction. There are two agonic lines at the present time (1913). One is a closed curve passing across Hudson Bay, into the Atlantic Ocean east of Florida, across Brazil, through the Antarctic Ocean, near the south pole of the earth, northward through Australia, the Indian Ocean, Russia, near the north pole of the earth, and back again. The other is a much smaller closed curve, called the "Siberian Oval," because it is contained in Eastern Siberia and China. The agonic lines as well as the isogonals and isoclinic lines are shown on special charts of the world published by the British Admiralty, and for the United States by the Coast and Geodetic Survey. See MAGNETISM, TERRESTRIAL.

AGONOTHE'TES (Gk. *Ἀγωνοθέτης*, from *ἀγών*, contest + *τίθημι*, place, arrange). The name of an official at Greek games, serving usually as judge of the contests. Sometimes as giver or exhibitor of them. See FESTIVALS; GREEK GAMES.

AG'ONY COL'UMN. In England, a term applied to that part of a newspaper, generally the second column of the advertisement sheet, headed by notices of losses and disappearances, mysterious communications, etc., corresponding to the American *personal column*.

AGOO, *á-gō'ō*. A town of Luzon, Philippines, in the province of La Union. It is situated on the west coast, about 19 miles south of San Fernando. Agriculture and fishing are the important industries. Cotton, sugar-cane, and rice are produced. Pop., 1903, 10,653.

A'GORA (Gk. *ἀγορά*, an assembly, later, a gathering-place). A part of a Greek city corresponding in general to the Forum (q.v.) of a Roman city. See ATHENS.

AG'ORAC'RITUS (Gk. *Ἀγοράκριτος*, *Agorakritos*). A Greek sculptor of the fifth century B.C. He was born on the island of Paros and was the favorite pupil of Phidias. His works are said to have been so perfect that the ancients were frequently uncertain whether they should be ascribed to him or to Phidias. His chief creation was the colossal figure of Nemesis at Rhamnus, which he is supposed to have developed from his unsuccessful Aphrodite, prepared for the contest with Alcamenes. Fragments of the work were discovered at Rhamnus; part of the head is in the British Museum. Consult Ulrich von Wilamowitz-Moellendorff, "Antigonos von Karystos," in his *Philosophische Untersuchungen*, vol. iv.

AG'ORAPHO'BIA. A symptom of neuras-

thenia, characterized by a fear of open spaces, not necessarily open country, but of streets, squares, or the interior of large buildings, theatres, churches, and the like.

AGOSTA, à-gō'stā, or **AUGUS'TA**. A walled city of Sicily, in the province of Syracuse, 19 miles north of that city. It stands on a peninsula (now an island), jutting into the Mediterranean, and is said to occupy the site of the Megara Hyblæa of the ancients. Agosta, founded by the Emperor Frederick II in 1232, played an important part in the war of the Sicilian Vespers, withstanding Charles of Anjou until betrayed into the hands of William L'Estendart, one of his barons (1286). The city was then sacked and the inhabitants ruthlessly butchered, and many years passed before Agosta was repopled or began to prosper. In 1551 Agosta was taken and burned by the Turks. Earthquakes devastated the city in 1268, in 1551, in 1693, when one-third of the inhabitants perished, and in 1848. In 1676 a great naval battle was fought near here between the Dutch under De Ruyter and the French. De Ruyter himself was killed. The port is spacious, but rather difficult of access. While salt is the chief article of export, oil, wine, cheese, fruit, honey, and sardines are also exported. Pop., 1901, 16,402.

AGOSTINO, ä'gō-stē'nō, and **AGNOLO**, ä'nyō-lō (active 1310-50). Sieneſe ſculptors and architects, of the ſchool of the Piſani (q.v.). They have been erroneouſly called brothers, becauſe they ſometimes worked together; but Agostino was the ſon of Giovanni, and Agnolo the ſon of Ventura. Their ſculptural maſterpieces include the monument of Biſhop Tarlati at Arezzo (1330) and that of the jurist Pino de Sinibaldi in the cathedral of Pistoia; much ſculpture is alſo aſcribed to them in Siena. Documentary evidence ſhows that each deſigned important buildings for their native town. Agnolo deſigned the important out-gates and the Caſtello of Grosſeto, while Agostino worked upon the vaults and the celebrated tower of the Palazzo Comunale, Siena, and the fortress of Maſſa. Agostino was uſually aſſiſted in his work by his ſon Giovanni.

AGOSTINO DI DUCCIO, dē dōōt'chō (1418-c.1481). A Florentine ſculptor and architectural decorator, one of the foremoſt of the later fifteenth century. His maſter in ſculpture is unknown; he probably developed as a ſtonemaſon. At 23 he executed a ſeries of reliefs for the cathedral at Modena (1442). Accuſed of theft, he fled from Florence in 1446, and in 1447 he was placed by the architect Alberti in charge of the ſculptural decorations of the interior of San Francesco at Rimini. Some parts of theſe, ſuch as the tomb of Sigismundo Malateſta, which is attributed to him, are maſterly. But his full capacity was ſhown in his next work, the façade of San Bernardino at Perugia, one of the fineſt pieces of Renaiſſance ſculpture compoſition (1457-61). In the ſpring of 1463 he was again in Florence. To this laſt period belong the beautiful tabernacle of Ogniſanti, Florence, the marble relief of the Madonna in the Muſeo del Opera, two others in the Louvre, and one of terra cotta in the Berlin Muſcum. His laſt-known work is the fine San Pietro Gate in Perugia, upon which he was occupied after 1480. His ſtyle was ſometimes mannered and incorrect, but always excellent from the decorative point of view. His forte was very low relief with evan-

escent effects, poetic female figures with marvelous flowing draperies.

AGOULT, à'gōō', MARIE CATHERINE SOPHIE DE FLAVIGNY, COMTESSE D' (1805-76). A French author, whose pseudonym was Daniel Stern. She was born at Frankfort-on-the-Main, but was educated at Paris, where, in 1827, she married the Count d'Agoult. Afterward she lived with Franz Liszt, and of her two daughters by him the youngest, Cosima, was married to Richard Wagner. After a series of novels, including *Hervé* (1841) and *Nelida* (1845), she published several political works, of which the best known are *Lettres républicaines* (1848), criticising the government of Louis Philippe, and the *Histoire de la Révolution de 1848* (3 vols., 1851-53). Her best work is *Esquisses morales et politiques* (1849), a volume of political and moral aphorisms in the style of the *Maximes* of Rochefoucauld. Though her moral laxity made her the subject of much unpleasant notoriety, the Comtesse d'Agoult's salon was, for many years, the rendezvous of many leading statesmen, poets, critics, painters, and musicians. There Alfred de Vigny, Chopin, Meyerbeer, Heine, George Sand, and Sainte-Beuve were frequently seen; there Ponsard read his tragedy of *Lucrece* for the first time. During the period from 1838 to 1848 her salon had merely a social character. When, however, the fall of Louis Philippe in the revolution of 1848 led her to join the ultra-democratic party and to begin her crusade against "property and capital, orthodoxy and family," society was closed against her, and it was then that such men as Rodrigues, Infantin, Lamartine, and Louis Blanc sought her company. Consult her own reminiscences contained in *Mes souvenirs* (Paris, 1877); and the works of Fleury, *Portraits révolutionnaires*, vol. i (Paris, 1889); also Rochelaure, *Une amitié romanesque: George Sand et Mme. d'Agoult* (Paris, 1895).

AGOUTA, à-gōō'tā. See SOLENODON.

AGOUTI, à-gōō'tē (Fr. through Sp., from the native name). Any of several large rodents of South America and the West Indies, of the genus *Dasyprocta* and family *Dasyproctidæ*. They are 18 or 20 inches long, have somewhat squirrel-like forms, with slender legs and hoof-like claws, and are brownish above and yellowish below. They inhabit woodlands, where they are gregarious and dwell in holes, and whence they ramble abroad, mainly at night, with grunting cries, to feed on vegetables, often doing great damage to sugar-cane. About 12 species are known, as: the "pampas hare," pursued as game in southern Brazil and southward; Azara's, the acouchy (or acuchi) of Guiana and the West Indies; the black and the yellow-rumped, which are West Indian and best known. Also spelled "agouty" and "aguti"; it is to be noted that Darwin (*A Naturalist's Voyage*) applies the name to the Patagonian cavy. See Plate of CAVIES accompanying CAVY.

AGRA, ä'grā. A part (formerly Northwest Provinces) of the United Provinces of Agra and Oudh (q.v.), British India, and a division, district, and city thereof. The area of the Agra portion of the United Provinces is 83,198 square miles; pop., in 1901, 34,859,109; in 1911, 34,624,040, of whom 29,415,419 are Hindus. Agra division, 10,078 square miles: pop., 1901, 5,249,970; 1911, 5,007,921. Agra district, 1845 square miles: pop., 1901, 1,060,528; 1911, 1,021,847. See AGRA (city).

AGRA (evidently from *Akbarabad*, city of Akbar). A city in the United Provinces of Agra and Oudh, British India, in the district of the same name on the right bank of the Jumna, 110 miles southeast of Delhi and 841 miles by rail northwest of Calcutta (Map: India, C 3). As the railway and administrative centre of its district and of the large division to which it gives its name, Agra is a place of great importance. It has an extensive trade in cotton, tobacco, indigo, salt, sugar, and grain, and manufactures of inlaid mosaic work, for which it is famous, gold lace, and shoes. It also has a considerable transport trade by the Jumna and Agra canal. Agra is fortified and has a garrison; there is a military station in the neighborhood of the city. The climate during the hot and rainy seasons (April to September) is injurious to Europeans, but, on the whole, the average health of the city is equal to that of any other station in the United Provinces. The mean annual temperature is 79° F.; January, 60°, June, 95°. The ancient walls of the city embrace an area of about 11 square miles, of which about one-half is at present occupied. The houses are, for the most part, built of the red sandstone of the neighboring hills. The principal street, running northwest from the fort, is very spacious, but the rest are generally narrow and irregular, though clean. The Strand, a thoroughfare on the river banks, is 2 miles long and 80 feet wide.

Some of the public buildings, monuments of the House of Timur, are of striking magnificence. Among these are the fine fortress built by Akbar, within the walls of which are the palace and audience-hall of the Emperor Shah Jehan, and the Moti Masjid or Pearl Mosque, so called from its surpassing architectural beauty. Still more celebrated is the Taj Mahal, situated without the city, about a mile to the east of the fort. This extraordinary and beautiful mausoleum, "the most splendidly poetic building in the world," was built by Shah Jehan for himself and his favorite wife, Arjiman Banoo (surnamed Mumtaz Mahal). Twenty thousand men, says Tavernier, who saw the work in progress, were employed incessantly on it for 22 years. The principal parts of the building are constructed or overlaid outside and in with white marble; and the mosaic work of the sepulchral apartment and dome is described by various travelers in terms of glowing admiration. It is composed of 12 kinds of stones, of which lapis-lazuli is the most frequent, as well as the most valuable. (See **TAJ MAHAL**.) Of British and other European edifices in and near the city, the principal are the buildings of a Catholic mission and episcopal see founded in the sixteenth century, the government house, the college for the education of natives, the Metcalfe testimonial, the English church, and the barracks. A committee appointed by the government administers municipal affairs, derives revenue from real estate and octroi, and operates the water works. This city is held in great veneration by the Hindus as the scene of the incarnation of Vishnu under the name of Parasu Rama. It first rose to importance in the beginning of the sixteenth century, and from 1526 to 1658 it was the capital of the Mogul sovereigns. In the latter year Aurungzebe removed to Delhi; thereafter Agra declined. It was taken in 1784 by Scindia, and surrendered in 1803 to Lord Lake after a bom-

bardment of a few hours. During the Sepoy mutiny of 1857 Agra was one of the places in which the Europeans were confined. They were obliged to abandon the city in June and retire to the fort or residency, to which fugitives also flocked from all parts of the country. Most of the European buildings in the city were burned by the Sepoys. Heroic sallies were made from the fort, until the place was relieved in October by the rapid and brilliant march of Colonel Greathed. Pop., 1901, 188,022; 1911, 185,449. See H. G. Keene, *The Agra Guide* (Agra, 1872), and E. B. Havel, *Handbook to Agra*, etc. (London, 1904). See **TAJ**.

AGRA AND OUDH. See **UNITED PROVINCES OF AGRA AND OUDH**.

AGRAM, ä'grám (Hungarian *Zágráb*, Croatian *Zagreb*). The capital of the Hungarian crownland of Croatia-Slavonia, beautifully situated at the foot of the Agram Mountains, about 2 miles from the Save, and 141 miles east-northeast of Fiume by rail (Map: Hungary, D 4). It consists of the upper, lower and episcopal towns. The chief public buildings are the cathedral, a late Gothic edifice dating from the fifteenth century; the palace of the *ban*, or governor; the National Theatre; the Gothic church of St. Mark; the archiepiscopal palace; the Academy of Sciences, with fine collections of pictures and antiquities, and the palace of justice. Agram is the seat of government of the highest courts of the province and of the archbishop. The city is a great centre of South-Slavic national life. Its educational institutions include the Franz Josef University, founded in 1874, a gymnasium, a high school, industrial school, normal training schools, and several libraries. Its manufactures include leather, linen, porcelain, silk, and tobacco, and it has a considerable trade in grain and wine, the latter made from the vineyards which nearly surround the city. Pop., 1890, 38,000; 1900, 57,690; 1910, 79,038. Probably Roman in origin, Agram became an episcopal see in 1093 and was destroyed by the Tatars in 1242. Rebuilt and made a free royal city, it developed rapidly. In 1880 it was partially destroyed by an earthquake and suffered considerably from another shock in 1901.

AGRAMAN'TE, or **AG'RAMANT**. The King of the Moors in Boiardo's *Orlando Innamorato* and in Ariosto's *Orlando Furioso*. He was the son of Trogano and crossed over into Gaul to ravage the land and avenge himself on Charlemagne for the death of his father. He was slain by Orlando.

AGRAMONTE, ä'grá-môn'tâ, IGNACIO (1841-73). A Cuban revolutionist. He was born at Puerto Príncipe, Cuba, studied law at the University of Havana, and was admitted to the bar in 1867. He took a conspicuous part in the insurrection which broke out against Spain in 1868 and became Secretary of the provisional government in 1869. He commanded the Cuban forces in the Camagüey district and for some time—on the retirement of Quesada, Jordan, and Cavada—acted as commander-in-chief. He was killed in the battle of Jimaguayú.

AG'RAPHA (Gk. unwritten, from *ἀ*, *a*, priv. + *γράφειν*, *graphein*, to write). Since the last part of the eighteenth century this term has been used to denote alleged sayings of Jesus not found in the canonical Gospels and yet deemed worthy of consideration as to their possible genuineness. With the growth of textual criticism

it became customary to put into the same class sayings of Jesus found in some manuscripts or versions of the Gospels, but not sufficiently supported to be regarded as having formed a part of the original text, as e.g., the addition to the Lord's Prayer (Matt. vi. 13b), the reference to exorcism of demons through prayer and fasting (Matt. xvii. 21), the words of the risen Jesus (Mark xvi. 9-20), and those spoken to the woman taken in adultery (John vii. 53-viii. 11). Finally, the term is also employed by some writers to designate alleged quotations from the Old Testament in the New Testament which are not found in our Hebrew text, and other passages in the New Testament, not containing words of Jesus, found in various manuscripts and versions, but not considered as part of the original text. In earlier times such agrapha were chiefly gathered from Acts, the Pauline epistles, the earliest apocryphal gospels, ancient liturgies, and patristic writers. More recently the material has greatly increased by the discovery of new gospel fragments and collections of sayings. The bulk of the rich apocryphal gospel-literature (see APOCRYPHA) has generally been left out of consideration as being too late to contain a reliable tradition. A collection of extracanonical sayings was made by Cotelerius, *Ecclesiae Græcæ Monumenta* (1677-88), who was followed by J. E. Grabe, *Spicilegium patrum et hæreticorum* (1698-1700), and J. B. Fabricius, *Codex Apocryphus Novi Testamenti* (2d ed., 1719). A more complete work on the subject was that of Alfred Resch, *Agrapha*, in Gebhardt and Harnack's *Texte und Untersuchungen*, 1889. His conclusions were criticised by J. H. Ropes, *Die Sprüche Jesu* (1896), who reduced the number of genuine sayings from 74 allowed by Resch to 13. Most critics, however, were unwilling to accept any of them as genuine. Great expectations were aroused by the announcement in 1897 that a papyrus had been discovered at Behnesa, the ancient Oxyrrhyncus, in Egypt, containing a number of sayings of Jesus, each beginning with "Jesus saith." They were published by the discoverers, Grenfell and Hunt, under the title *Logia Jesu: Sayings of our Lord from an Early Greek Papyrus* (1897). The seven distinct sayings proved to be of a very late type, showing a certain kinship to the Gospel according to the Egyptians, and are now generally dated between 150 and 300 A.D. The same applies to the five additional sayings found at the same place some years later and published by Grenfell and Hunt under the title: *New Sayings of Jesus and Fragment of a lost Gospel from Oxyrrhyncus* (1904). The latest and most extensive presentation and discussion of the whole material is the second edition of Resch's book, called *Agrapha: Ausserkanonische Schriftfragmente*, in the *Texte und Untersuchungen* (1906). He there maintains that 36 are genuine. As a rule, however, New Testament scholars hesitate to admit the authenticity of any of them. See Hennecke, *Neutestamentliche Apocryphen* (1904), and *Handbuch zu den neutestamentlichen Apocryphen* (1904); Preuschen, *Antilegomena* (2d ed., 1905); Bernard Pick, *Paralipomena. Remains of Gospels and Sayings of Christ* (1908).

AGRAPH'IA. A variety of aphasia, characterized by inability to write.

AGRA'RIAN LAWS (Lat. *leges agrariæ*). Laws regulating the division or the holding of the public or State lands (*ager publicus*) of the Roman domain. With the name of agrarian laws

was formerly associated the idea of the abolition of property in land, or at least of a new distribution of it. This notion of the agrarian laws of the Romans was not only the popular one, but was also received by most scholars. The French Convention, in 1793, passed a law punishing with death any one who should propose an agrarian law, understanding by the term an equal division of the soil among all citizens. Now, it would have been strange if the Romans, with whom private property was so sacred, could ever have been brought to sanction any measure of that kind. German scholars, Heyne, Savigny, and especially Niebuhr, first explained the true character of the Roman agrarian laws. There are still some disputed points in this matter; but one thing is settled—those laws had no reference to private lands held in absolute property but to public or State lands. Their purpose was to give to the poorer citizens allotments out of the land belonging to the State and to regulate the terms on which such assignments and the rest of the land not so allotted could be held and used.

As the dominion of Rome extended (an extension due for centuries wholly to conquest), a portion of each conquered territory, sometimes as much as a third, was confiscated to the State and became public domain. All laws respecting the disposition of these lands were called agrarian laws, which are therefore of various kinds. What caused these laws to be so long mistaken for an interference with private rights, and excited such opposition to them, was the use which was made of the public domain while it was unappropriated. "It was the practice at Rome," says Dr. Arnold, "and doubtless in other States of Italy, to allow the individuals to occupy such lands, and to enjoy all the benefits of them, on condition of paying to the State the tithe of the produce, as an acknowledgment that the State was the proprietor of the land, and the individual merely the occupier. Now, although the land was undoubtedly the property of the State, and although the occupiers of it were in relation to the State mere tenants-at-will, yet it is in human nature that a long undisturbed possession should give a feeling of ownership; the more so as, while the State's claim lay dormant, the possessor was, in fact, proprietor, and the land would thus be repeatedly passing by regular sale from one occupier to another."

The State, however, was often obliged to interfere with these occupiers of the public lands and to resume its rights. The very idea of a citizen, in ancient times, involved that of a landholder, and when new citizens were to be admitted, each one had to receive his portion out of the unallotted public domain; this involved, of course, the ejection of the tenants-at-will. It appears, also, that the right to enjoy the public lands in this temporary way was confined to the old burghers or patricians. This, taken in conjunction with the tendency, strong at all times, of larger possessions to swallow up smaller, kept up an ever-increasing number of landless commoners, whose destitution and degradation came from time to time to such a pitch that alleviation was necessary to prevent the very dissolution of the State. Hence sprang such agrarian laws as are considered below. It is easy, however, to see what motive the patricians, as a body, had to oppose all such measures, since it was their interest, though not their right, to keep the lands unallotted.

The enactment of agrarian laws occasioned some of the most remarkable struggles in the internal history of Rome. Most of the kings of Rome are said to have carried an agrarian law; that is, to have divided a portion of the public land among those whom they admitted to the rights of citizenship. About 24 years after the expulsion of the Tarquins, the distress of the commons called aloud for remedy, and in 486 B.C. the consul Spurius Cassius proposed an agrarian law, of whose nature we have no real knowledge. The aristocracy, however, contrived to defeat the proposal, and, when the year of his consulship was out, Cassius was accused of having tried to win popularity to make himself king, was condemned for treason, scourged, and beheaded, and his house was razed to the ground.

The first important agrarian legislation of a permanent nature actually passed was that proposed by the tribunes C. Licinius Stolo and L. Sextius, and carried, after a struggle of five (or, according to some authorities, ten) years, in the year 367 B.C. The provisions of this legislation, known as the Licinian Rogations (q.v.), *Rogationes Licinianaë*, were as follows: "Every Roman citizen shall be entitled to occupy any portion of the unallotted State land not exceeding 500 *jugera* (see ACRE), and to feed on the public pasture land any number of cattle not exceeding 100 head of large, or 500 head of small, paying in both cases the usual rates to the public treasury. Whatever portions of the public land beyond 500 *jugera* are at present occupied by individuals shall be taken from them and distributed among the poorer citizens as absolute property, at the rate of seven *jugera* apiece. Occupiers of public land shall also be bound to employ a certain number of freemen as laborers.

This law produced for a time very salutary effects. But before the year 133 B.C., when Tiberius Gracchus was elected tribune, the Licinian laws had been suffered to fall into abeyance; and although vast tracts had been acquired by the Italian, the Punic, and the Greek wars, no regular distribution of land among the destitute citizens had taken place for upward of a century. Numerous military colonies had indeed been founded in the conquered districts, and in this way many of the poorer Romans or their allies had been provided for; but there still remained large territories, the property of the State, which, instead of being divided among the poorer members of the State, had been occupied and brought into cultivation by the rich capitalists, many of whom thus came to hold thousands of *jugera*, instead of the 500 allowed by the Licinian laws. To a Roman statesman, therefore, looking on the one hand at the wretched pauper population of the meaner streets of Rome, and on the other at the enormous tracts of the public land throughout Italy which the wealthy citizens held in addition to their own private property, the question which would naturally present itself was: Why should not the State, as landlord, reclaim from these wealthy capitalists, who are her tenants, as much of the public land as may be necessary to provide little farms for these pauper citizens, and so convert them into respectable and independent agriculturists? This question must have presented itself to many; but there were immense difficulties in the way. Not only had long possession of the State lands, and the expenditure of large sums in bringing them into cultivation, given the wealthy tenants a sort of proprietary claim

upon them, but in the course of generations, during which estates had been bought, sold, and inherited, the State lands had become so confused with private property that in many cases it was impossible to distinguish the two. Notwithstanding these difficulties, Tiberius Gracchus had the boldness to propose an agrarian law, to the effect that no one should occupy or use more than 500 *jugera* of the State land (a father of a family might occupy 500 *jugera* of the State land for himself and 250 *jugera* additional for each of his sons, with a maximum of 1000 *jugera*); in every case where this amount had been exceeded, the State should reclaim the surplus, paying the tenant a price for the buildings, etc., which he had been at the expense of erecting on the lands thus taken from him. The recovered lands were then to be distributed among the poor citizens; a clause was inserted in the bill to prevent these citizens from selling the lands thus allotted to them, as many of them would have been apt to do.

According to the laws and constitution of Rome, there was nothing essentially unjust in this proposal, which was, in private, at least, approved of by some of the most distinguished men of the time. The energy of Tiberius Gracchus carried the measure, in spite of the opposition of the aristocratic party, to whose enmity he fell a victim. His work was taken up a decade later by his brother Gaius, who also met a violent death. (See GRACCHUS.) The attempts to carry out the "Sempronian law," as it was called (from the name of the *gens* to which the Gracchi belonged), were attended with great difficulties, and although not formally repealed, it continued to be evaded and rendered inoperative. Various agrarian laws were subsequently passed, some by the victorious aristocratic party, in a spirit directly opposed to that of the Licinian and the Sempronian laws.

Beside agrarian laws having for their object the division among the commons of public lands usurped by the nobles, there were others of a more partial and local nature, for the establishment of colonies in particular conquered districts; these naturally met with less opposition. Still more different were those violent appropriations of territory made by the victorious military leaders in the later times of the Republic, in order to reward their soldiers and to establish exclusively military colonies (such appropriations, made, e.g., by Sulla and Octavianus, were called proscriptions). In these the private rights of the previous occupants were often disregarded. Consult Botsford, *The Roman Assemblies* (New York, 1909); Hardy, *Six Roman Laws* (Oxford, 1911).

AGRARIAN PARTY. See POLITICAL PARTIES, *Germany*.

AGRAVAINE, Sir. One of the knights of the Round Table. He and his half-brother Sir Mordred hated Sir Launcelot, and, according to Sir Thomas Malory, contrived to surprise him in Queen Guinevere's apartment, after they had sent the King out hunting. Sir Launcelot, however, killed Sir Agravaire and the 12 attendants; only Sir Mordred escaped.

AGREDA, à-grā'dà, MARIA (CORONEL) DE (1602-64). The superior of the convent of the Immaculate Conception, whose monastic name was Maria of Jesus. She was born at Agreda, Spain. She reported that she had had revelations from heaven, and that God had commanded her to write an inspired life of Mary, the mother

of Jesus. The book is entitled *La Mística Ciudad de Dios*, etc. (3 parts, Madrid, 1670; French trans., *La cité mystique de Dieu*, etc., 6 vols., Marseilles, 1695, Paris, 1857; German trans., *Die geistliche Stadt Gottes*, etc., 2d ed., Regensburg, 1893). Pope Innocent XI prohibited its universal circulation, but, at the request of the King of Spain, excepted the Spanish countries. An English translation has recently been made.

AGREEMENT. See CONTRACT.

AGREEMENT, METHOD OF. See INDUCTION.

AGREEMENT OF THE PEOPLE, THE. A remarkable document set forth by the Council of the Army, Jan. 15, 1649, 15 days before the execution of King Charles I of England. It is based upon "The Heads of the Proposals Offered by the Army," Aug. 1, 1647, except that no reference is made to royalty; and it is an outline of a written constitution for a republic. According to its provisions, the existing Parliament is to be dissolved on or before the last day of April, 1649; and thereafter an assembly called the "Representative," composed of not more than 400 members, is to be elected by the people every two years on the first Thursday in May. The members, or "representers," are fairly distributed among the counties of England and Wales, thus remedying the defects in the existing apportionment. The franchise is conferred upon such natives or denizens "as are assessed ordinarily toward the relief of the poor," provided they be men 21 years of age or housekeepers "dwelling within the division for which the election" is held. Servants "receiving wages from any particular person" are excluded; and those who have aided the King are temporarily denied the right of voting or of being chosen members of the assembly. Officials are not eligible, and lawyers are incapable of practicing their profession while serving as representers. There is to be a "Council of State for the managing of public affairs." The Christian religion "is held forth and recommended as the public confession"; but it is to be "reformed to the greatest purity in doctrine, worship, and discipline." Popery and prelacy are not tolerated, and the "teachers" or ministers are to be paid from the public treasury. To the assembly is given the "supreme trust in order to the preservation and government of the whole"; but six important points are absolutely "reserved" from legislative action. With the exception of those of the Connecticut and New Haven colonies, the agreement is the earliest example of a written instrument designed for the government of a commonwealth. But this English constitution was never established, since "The Levelers" who stood sponsor for it were defeated by Cromwell. For the text of the agreement, consult Gardiner, *Constitutional Documents*, pp. 270-282 (Oxford, 1889); for a full discussion, his *History of the Civil War* (new ed., London and New York, 1894-97). See LEVELERS.

AGRICOLA, ALEXANDER (c.1446-1506). One of the most famous composers of the School of the Netherlands. He was of German birth, his real name being Ackermann. The works which have been preserved comprise several masses, motets, magnificats, and about 30 chansons.

AGRICOLA, CHRISTOPH LUDWIG (1667-1719). A German landscape painter. Born at Regensburg, he passed much of his life in traveling and lived long at Naples. He was greatly esteemed by his contemporaries, but his work seems stilted

and unnatural to modern taste. One of the so-called classic or heroic landscape painters, he developed under the influence of Gaspard Poussin and Claude Lorraine. His works are found chiefly in German and Italian galleries.

AGRICOLA (Latin version of his original German name BAUER), GEORG. A German scholar and scientist of wide attainments. Born March 24, 1494, at Glauchau, Saxony; entered the University of Leipzig in 1514; graduated in 1517 with the degree of B.A.; in 1518, vice-principal, and two years later principal, of the Municipal School at Zwickau, during which time he published a small Latin grammar; from 1524-1526 studied medicine, philosophy, and then natural sciences at various universities in Italy; and in 1527 chosen town physician at Joachimsthal, in Bohemia, in the midst of the most active mining centre in Central Europe. While not busy professionally, he studied mining, mineralogy, and geology, and in 1530 resigned his appointment to travel for three years and study mining in different parts of the country, after which he accepted the appointment of city physician of Chemnitz, Saxony, 1533, where he resided until his death, caused by fever, Nov. 21, 1555. For eight years after moving to Chemnitz there is very little record of his activities, but soon after (1544), he began publishing his more important books. His most important work, the one for which he is best known, *De Re Metallica*, consisting of 12 books covering mining, metallurgy, and geology, was begun about 1533, completed about 1550, went to press in 1553, and appeared in 1556, one year after his death. The original publication in Latin was translated into German and Italian, and in 1912 appeared in English, translated by Herbert Clark Hoover and Lou Henry Hoover, and published by *The Mining Magazine* of London. The original publication, together with 10 editions in three languages, served as a textbook and guide to miners and metallurgists for 180 years until the publication of Schluter's work on Metallurgy in 1738. In this book Agricola repudiates with great vigor certain teachings of the Greeks and has no patience with the alchemists. For the first time we receive descriptions of methods and processes based upon research and observation as opposed to speculation. In 1546 appeared *De Natura Fossilium* (revised 1558), which deserves an equal place with *De Re Metallica*. The work comprises 10 books on mineralogy and is the first attempt at a systematic subdivision. *De Ortu et Causis Subterraneorum* appeared in 1546 (revised 1558) and consists of five books on geologic phenomena. In 1530 *Bermannus*, his first work on mining, appeared. Many other books on mining, geological, medical, religious, political, and historical subjects appeared up to the time of his death.

It was not until 1546 that he entered public life in a diplomatic and advisory capacity at the request of Duke Maurice. Although the government was in the hands of Protestants, Agricola, a staunch Catholic and much favored by the Saxon electors, was elected Burgher of Chemnitz and the same year appointed Burgomaster. During the Schmalkaldic War he was sent on various missions from the Duke to Emperor Charles, King Ferdinand of Austria, and other princes. At the close of the war his public duties did not cease, as we read of his attendance at the Diet of Leipzig in 1547, 1549,

and 1553; at the Diet at Trojan, 1550, and again a second time just before his death. In recognition of his scientific investigations and publications on mining and allied subjects, he received a pension from Duke Maurice recorded in a letter dated June 14, 1543, consisting of "a freehold house, the right to brew beer for his household, and that he shall not be summoned before any Court of Justice, but only before us and our Councilor." As Burgomaster of Chemnitz at the time of his death, he was entitled to burial in the Protestant church of St. Jacob. This burial was refused his family at the command of the Prince, as the feeling against the Catholics was high at the time and the Prince probably was afraid of public disturbances. After a delay of four days his body was moved to Zeitz and interred in the cathedral.

We have a record of his marriage, in 1543, to Anna, widow of Matthias Meyner, a petty tithe official. There is reason to believe that Anna was his second wife and that he had several children. Consult: Jacobi, *Der Mineralog Georg Agricola und sein Verhältniss zur Wissenschaft seiner Zeit* (Werdau, 1889). Hoover, trans. of *De Re Metallica*, published by *The Mining Magazine* (London, 1912).

AGRICOLA, GNÆUS JULIUS (37-92). A Roman of the imperial times, distinguished not less by his great abilities as a statesman and a soldier than by the beauty of his private character. He was born at Forum Julii (now Fréjus, in Provence). Having served with distinction in Britain, Asia, and Aquitania, and gone through the round of civil offices, he was, in 77 A.D., elected consul, and in the following year went as Governor to Britain—the scene of his military and civil administration during the next seven years. He was the first Roman general who effectually subdued the island, and the only one who displayed as much genius and success in training the inhabitants to the amenities of civilization as in breaking their rude force in war. In his seventh and last campaign (84 A.D.) his decisive victory over the Caledonians under Calgacus, at a place called Mons Graupius, established the Roman dominion in Britain to some distance north of the Forth. After this campaign his fleet circumnavigated Britain for the first time, proving it to be an island. Among the works executed by Agricola during his administration were a chain of forts between the Solway Firth and the Tyne and another between the firths of Clyde and Forth. Numerous traces of his operations are still to be found in Anglesey and North Wales and in Galloway, Fife, Perthshire, and Forfarshire. The news of Agricola's successes inflamed the jealousy of the Emperor Domitian, and he was speedily recalled. Thenceforth he lived in retirement, and, when the vacant proconsulships of Asia and Africa lay within his choice, he prudently declined promotion. The jealousy of the Emperor, however, is supposed to have hastened his death, which took place at the early age of 55. His *Life*, by his son-in-law, Tacitus, has always been regarded as one of the choicest specimens of biography in literature. For an excellent modern edition of it, see that by Furneaux (Oxford, 1898). See **TACITUS**.

AGRICOLA, JOHANN (1492-1566), also called Magister Islebius (i.e., of Eisleben), but seldom by his patronymic, Schnitter. A zealous disciple of Luther, whom he served as teacher and Preacher at Frankfort-on-the-Main, Eisleben,

Wittenberg, and Leipzig, but with whom he became involved in the Antinomian controversy (see **ANTINOMIANISM**), and withdrew to Berlin in 1540, where, under stress of poverty, he made a recantation, ineffectual and probably not sincere. Joachim II, Elector of Brandenburg, became his protector, and made him court preacher and general superintendent, in which office he labored zealously for the spread of Protestantism until his death at Berlin, Sept. 22, 1566. His share in drawing up the Augsburg Interim (1548) made him unpopular for a time, but did not permanently check the growth of his influence in Brandenburg, which became very great. He wrote several theological treatises, now forgotten, but he will always be remembered for his collection of German proverbs, *Die gemeinen deutschen Sprüchwörter mit ihrer Auslegung* (1592), a work of native humor, morality, and patriotism that has endeared him to the heart of scholarly Germany. His life was written by Kawerau (1881).

AGRICOLA, MARTIN (1486-1556). A German composer and writer on musical subjects, born at Sorau, Silesia. From 1524 until his death he was cantor and musical director in the first Protestant school established at Magdeburg. His books are marked by a forceful style and extensive knowledge, and in his own day passed through numerous editions. His *Musica Instrumentalis* (1528) is, together with Virdung's work, our principal source of information regarding the old instruments. It contains not only numerous illustrations, but also detailed explanations as to the mechanism and the method of playing each instrument. This work was reprinted by Eitner as vol. xx of the publications of the Gesellschaft für Musikforschung. Other important works are *Rudimenta Musicæ* (1529), republished in 1543 under the title *Quæstiones Vulgariores in Musicam; Musica Figuralis Deudsch; Von den Proportionibus*.

AGRICOLA, RODOLPHUS (properly **ROELOF HUISMAN**) (1443-85). An eminent Dutch humanist, born at Bafflo. He studied at the universities of Louvain and Paris and afterward in Italy and by his Latin style and his skill in disputation attained high scholastic distinction. For some time he lectured on classical philology and philosophy at Heidelberg. The most important of his works is the *De Inventione Dialectica* (1467), in three books, in opposition to the scholastic philosophy; but he is noteworthy less for his writings than for his personal influence. He did much to substitute classical Latinity for mediæval barbarisms, to diffuse in Germany the knowledge of Greek; in short, to transmit beyond the Alps the spirit of the Italian renaissance of letters. Of theology, painting, and music he seems also to have known considerable. His writings were collected by Alardus (2 vols., Cologne, 1539). Consult Tresling, *Vita et Merita Rodolphi Agricolaë* (Groningen, 1830), and Ihm, *Der Humanist Rudolf Agricola, sein Leben und seine Schriften* (Paderborn, 1893).

AGRICULTURAL ANT. A species of ant living on the semi-arid plains of Texas that cultivates areas of grass about its dwelling. On this cultivated space, which may have a diameter of 10 to 15 feet, only one kind of grass is allowed to grow, and it is said that the seeds of this grass are even planted by the ants. Roads are laid out radiating from the ant hill across the plain, and all shoots of undesirable plants are promptly nibbled off as rapidly as they appear.

among the crops. When the harvest of the protected grass is ripe, the ants collect the seeds and convey them along the radiating highways to the chambers in the hill. Interesting and wonderful as is the economy of these ants, the insects may, when the colonies are large and numerous enough, do considerable damage to the grain fields in which the mounds are reared and the clearings made. See ANT; INSECTS; and consult McCook, *Agricultural Ant of Texas* (Philadelphia, 1879). Wheeler, *Ants* (New York, 1910), considers it probable that the supposed actual planting near the nest is due to the growth of seeds which have sprouted in the underground stores of grain, and becoming thus useless for food have been carried out and left near the entrance.

AGRICULTURAL ASSO'CIATION. A voluntary association of farmers or other persons interested in agriculture, formed for the purpose of promoting a knowledge of agriculture.

United Kingdom. The movement began with the organization of the Society of Improvers in the Knowledge of Agriculture in Scotland, in 1723, by a company of landholders. This society existed for more than 20 years and did much valuable work. Its *Select Transactions* were published in 1743. The Bath and West of England Society was established in 1777, and the Highland Society in 1784. The latter society afterward included in its operations the whole of Scotland, and under the name of the Highland and Agricultural Society of Scotland has ever since continued its work. The Highland Society has a large income, expended in studying manures, feeding stuffs, seeds, plants, etc.; in holding annual shows of live stock, implements, etc., at which large prizes are offered; and in publishing an annual volume of *Transactions*.

The Royal Agricultural Society of England, founded in 1838, has been an important factor in the development of British agriculture, and, indeed, has undertaken many duties which in other countries are performed by the government. This society has at present more than 10,000 members, holds an annual show of live stock, implements, and machinery, dairy and other products, at which some \$50,000 is distributed in prizes. It issues a quarterly journal, containing information on a great variety of agricultural topics, retains the services of chemical, botanical, zoölogical, and veterinary experts for advice to members, as well as for experiments and research, maintains an experimental farm at Woburn, and a veterinary college at Camden Town, London, and conducts, in coöperation with the Highland and Agricultural Society of Scotland, an annual examination for a national diploma in the science and practice of agriculture.

The Agricultural Organization Society, Ltd., was founded in 1901 to organize in England and Wales agricultural coöperative societies. It has about 400 affiliated societies with a membership of over 20,000. There are also several hundred non-affiliated societies. Similar, but smaller, central societies were subsequently organized in Scotland and Ireland and have a large number of branches.

In Ireland the interests of agriculture are also promoted by a department of the Royal Dublin Society, chartered in 1749, and other agricultural organizations. Agricultural societies are maintained also in Wales, Canada, Australia, and other parts of the British Empire.

United States. In the United States the first society for promoting agriculture was es-

tablished at Philadelphia in 1785. In the same year a similar society was formed in South Carolina, followed by those in Kennebec, Me. (1787), New York City (1791), and the Massachusetts Society for Promoting Agriculture (1792). The movement continued, until in 1809 we have the germ of a national organization in the Columbian Agricultural Society, formed in the District of Columbia. The holding of agricultural shows, or "fairs," was begun in the city of Washington in 1804 and was made a popular movement largely through the efforts of Elkanah Watson, of Massachusetts, who, beginning with an exhibition of two imported merino sheep on the public square at Pittsfield, Mass., in 1807, soon developed the more elaborate and picturesque "cattle shows" which for many years have been popular rural festivals, especially in New England. Shows are now held in different parts of the country by 2740 international, national, State, county, and other local and interstate associations, 1647 being devoted to general agriculture, 801 to poultry, and the remainder divided among horticulture, floriculture, live stock, dairy products, dogs, etc. Societies for promoting different agricultural interests have been organized under many different forms, and many of these are now in a flourishing condition. Many of the States have important agricultural societies, the published reports of which contain much valuable information. There are also national, State, and local associations for the livestock interests (including the breeding of cattle, horses, sheep, swine, and poultry), dairying, horticulture, forestry, irrigation, good roads, bee-keeping, etc. The great majority of farmers' organizations have endeavored to develop some phases of business coöperation, and many have been formed for this specific purpose. In 1908 it was estimated that there were about 85,000 farmers' coöperative organizations with an estimated membership of more than 3,000,000. About 30,000 societies were irrigation associations, and others were coöperative telephone companies, grain elevators, creameries, associations for insurance against fire, hail, loss of live stock, etc., marketing of fruits and vegetables, purchase of supplies, etc. (See COÖPERATION.) In 1913 the United States Department of Agriculture established a rural organization service to assist farmers in forming organizations for bettering agriculture and country life.

Among the general associations which have exerted the most widespread influence in the United States are the Farmers' Alliance, the Patrons of Husbandry (otherwise known as the Grange), and the Farmers' Educational and Coöperative Union. See the separate articles on FARMERS' ALLIANCE and GRANGE.

Germany. The first agricultural society in Germany is said to have been established in 1764. Now there are several thousand societies in the German Empire. The most important of these is the German Agricultural Society, with headquarters at Berlin, which is the largest in the world with a membership of some 15,000. It holds a great annual meeting and fair, at which numerous prizes are given, a winter meeting, and meetings of sections on fertilizers, plant culture, seeds, implements, and agricultural technology and engineering; gives prizes for essays based on scientific investigations, tests agricultural materials, carries on a large amount of experimental inquiry through coöperation with agricultural experiment stations, publishes a

year-book and a journal appearing weekly, and maintains a bureau of information. It also aids its members in the coöperative purchase of fertilizers, seeds, and feeding stuffs.

France. The Society of Agriculturists of France has more than 11,000 members, maintains a library and chemical laboratory, holds meetings at which lectures are given by eminent agricultural experts, gives annual prizes, patronizes the agricultural shows given under the ministry of agriculture in different parts of France, and issues a semi-weekly publication. The National Society of Agriculture of France is another very important French society.

The Royal Danish Agricultural Society, the Central Society of Agriculture of Belgium, the Italian Federation of Agricultural Societies, the Imperial Agricultural Society of Vienna, the Agricultural Association and Union of Hungary, the League of Swiss Peasants, and the Imperial Economic Association at St. Petersburg are among the most active and influential agricultural organizations in Europe.

Agricultural Syndicates. In recent years coöperative unions (see COÖPERATION) have been formed by thousands in most of the countries of Europe, and less extensively in Asia, Africa, and Australia, and have exerted an increasing influence in the promotion of agricultural advancement. These have reached their most complete development, as directly related to agriculture, in France, where they are known as agricultural syndicates. The syndicates are national, regional, or local in their organization and operations. Their number has reached about 5000 and their membership about 800,000, including all classes interested in agriculture. They do an extensive business in the purchase of fertilizers, feeding stuffs, seeds, plants, implements, and live stock (especially animals for common use in breeding), and in the sale of agricultural products. They have also established coöperative dairies, and factories for fruit pulp, olive oil, etc., and have developed numerous forms of coöperative insurance. They have also disseminated much information through meetings and the agricultural press, and have exerted important political influence on legislation affecting agricultural interests. Some syndicates have received financial aid from the government, and others have been aided by private endowments. Otherwise they are supported by fees and brokerage. The organization and spread of the syndicates have been greatly promoted by the assistance of the agricultural societies throughout France.

AGRICULTURAL CHEM'ISTRY. See CHEMISTRY, AGRICULTURAL.

AGRICULTURAL COÖPERATION. See COÖPERATION; MARKETING ASSOCIATIONS, AGRICULTURAL; RURAL CREDIT.

AGRICULTURAL CREDIT. See CREDIT, AGRICULTURAL.

AGRICULTURAL ED'UCA'TION. The modern system of agricultural education in its most complete form includes (1) university courses of instruction and research; (2) general college courses; (3) college courses or schools in special subjects, e.g., dairying, animal husbandry, apiculture, or veterinary science; (4) special secondary agricultural schools; (5) vocational departments and agricultural courses in high schools; (6) instruction in elementary schools; (7) university and school extension, through farmers' institutes, correspondence courses, "movable schools," etc. The term "agriculture," as

related to education, may be used broadly with reference to an institution or course of instruction in which agricultural subjects are taught along with other branches of knowledge. It is in this sense, for example, that we speak of a college of agriculture or a college course in agriculture. Or the term may be restricted to that portion of a course of instruction in which agricultural subjects only are taught, as when we say, "Agriculture is taught in that college."

Technical agriculture has been subdivided by the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations into (1) agronomy, (2) zoötechny, (3) agrotechny, (4) rural engineering, and (5) rural economics. Agronomy is defined as "the theory and practice of the production of farm crops," and is made to include what is to be taught regarding the structure, composition, and physiology of farm crops and their environment, i.e., climate, soil, fertilizers, etc., and regarding the culture, harvesting, preservation, and uses of individual kinds of crops, as well as the obstructions to their growth from weeds, fungi, bacteria, insects, birds, and other animals. Zoötechny is "the theory and practice of the production of animals useful to man," and includes especially types, breeding, feeding, hygiene, and systems of management of different kinds of farm animals. Agrotechny is "the theory and practice of the conversion of raw materials produced by agriculture into manufactured articles for use in commerce and the arts." In its broadest sense, agrotechny includes such things as the making of butter, cheese, sugar, vinegar, concentrated foods, canned goods, liquors, textiles, leather, etc.; but in the agricultural colleges generally, only dairying is usually taught under this head. Rural engineering is "the science and art of laying out farms, designing and constructing farm buildings and works [i.e., water systems, irrigation works, drains, sewage systems, and roads], and making and using farm implements and machinery." Rural economics "treats of agriculture as a means for the production, preservation, and distribution of wealth by the use of land for the growing of plants and animals."

United States. Probably the earliest record of agriculture as a school subject within the present limits of the United States is found in the account of the early mission schools established by the Franciscan monks in what is now Mexico. The exact date of the establishment of these schools is not known, but in 1629 there were many elementary schools for natives scattered through the pueblos of New Mexico, according to the *Memorial of Benavides to the King of Spain*, dated 1630 and printed at Madrid in that year. The Franciscan fathers were the teachers, and the children were taught, in addition to non-agricultural subjects, "the use of the horse, the cow, and the sheep; they followed the plow and sowed the seed with their own hands, supplemented the primitive practices with the more scientific and fruitful methods of agriculture brought from the Old World."

Agitation for agricultural education in the United States began in the middle of the eighteenth century. In 1751 William Smith issued a prospectus designed as a model for colleges in which he provided for the chemistry of agriculture. His plan was carried out to some extent in Philadelphia Academy, now the University of Pennsylvania. Animal husbandry

and commerce were mentioned in the original prospectus of King's College (Columbia University), dated May 31, 1754, and agriculture and merchandise in the "Laws and Orders" adopted by the governors June 3, 1755. A professorship of botany and agriculture was established in 1792, and Samuel Latham Mitchill, M.D., LL.D., was elected to the position. In describing a summer course in botany Dr. Mitchill says: "An attempt is made by the professor, who is a practical farmer, to elucidate and explain the economy of plants, and affinity to animals, and the organization, stimuli, life diseases, and death of both classes of beings. The physiology of plants . . . is therefore particularly enlarged upon, as connected with garden and farming." In 1801 the Massachusetts Agricultural Society started a subscription which resulted in the establishment of a professorship of natural history in Harvard College in 1804. The Bussey Institution was founded by a bequest made in 1842 to Harvard College for the purpose of teaching agriculture, but was not opened until 1870. Early schools of agriculture include a school established, in 1825, at New Harmony, Ind., by William McClure in connection with the socialistic experiment known as the New Harmony movement. The Oneida Manual Labor Institute at Whiteboro, N. Y., established by George Washington Gale in 1827, gave instruction in carpentry and agriculture until its close in 1834. Dummer Academy, Newbury, Mass., in 1824; the Derby Agricultural School, Derby, Conn., 1826; Andover Theological Seminary, Andover, Mass., 1838; and Westboro Academy, Westboro, Mass., 1856,—all attempted in the years indicated, though unsuccessfully, to include agriculture as a regular part of their curricula. The Farm School, Thompson's Island, Boston, has given instruction in agriculture since 1833. Work of recognized scientific merit was inaugurated at the Sheffield Scientific School, Yale, in 1848, by the establishment of a chair of agricultural chemistry and vegetable and animal physiology, under John P. Norton. His pupil and successor was Samuel W. Johnson, the well-known author of *How Crops Grow*, who for many years was a leader in the movement for agricultural education. Associated with him as professor of agriculture was William H. Brewer, who was also a student under Professor Norton and was identified with agricultural schools established in New York prior to 1860. The Gardiner Lyceum, begun in 1823 in Maine with the aid of a grant of money from the State, especially for the education of mechanics and farmers, had a professor of agriculture, a practical farm, and special short winter courses, and was successfully maintained for many years.

The New York Legislature passed acts in 1853 for a State agricultural college and an industrial school to be known as "The People's College." These institutions never became firmly established, but Amos Brown, the president of the People's College, was largely instrumental in securing national legislation favoring industrial education. Michigan in 1857, and Pennsylvania and Maryland in 1859, established agricultural colleges which grew to be permanent institutions.

Land-Grant Colleges. Scientific instruction in agriculture was put on a permanent basis by the Morrill Act of 1862. On Dec. 14, 1857, Justin S. Morrill introduced into the House of Representatives a bill "donating public lands to the several States and Territories which may

provide colleges for the benefit of agriculture and mechanic arts." Though the bill was reported at first adversely, and after passage was vetoed by President Buchanan, it was reintroduced by Senator Morrill in modified form, passed by Congress, and approved by President Lincoln July 2, 1862. In its final form this land-grant act was a comprehensive measure providing for "the endowment, support, and maintenance of at least one college [in each State] where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts . . . in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." For these purposes there were granted to the several States 30,000 acres of land for each member in Congress, the entire proceeds of the sales of which was to constitute a perpetual fund for the benefit of these institutions. The total amount received by the colleges established under this act was over \$13,500,000 in 1912, and nearly 1,000,000 acres still remained to be sold, valued at approximately \$5,000,000.

In their early history the courses in agriculture in these colleges met with many discouragements. In 1887 a new impetus was given to their development by the act of Congress (Hatch Act) giving each State \$15,000 for an agricultural experiment station (see AGRICULTURAL EXPERIMENT STATION), which must ordinarily be a department of the land-grant college. In 1890 by a second Morrill Act these colleges received an immediate appropriation of \$15,000 per State, increasing by \$1000 each year for 10 years and thereafter \$25,000 a year, to be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic sciences. In 1906 the Adams Act was passed by Congress, giving each State an additional \$15,000 a year for the experiment station. In 1907 the Nelson Amendment to the appropriation bill for the United States Department of Agriculture provided an immediate appropriation of \$5000 to each State and Territory, an increase of \$5000 each year for four years, and thereafter \$25,000 annually for the benefit of the colleges of agriculture and mechanic arts, with the provision that "the said colleges may use a portion of this money for providing courses for the special preparation of instructors for teaching the elements of agriculture and the mechanic arts." Each State, therefore, receives in addition to the income of the Land-Grant Act of 1862, \$50,000 annually from the Federal government for instructional purposes in agriculture and mechanic arts, and \$30,000 for the experiment stations. The instruction funds are divided in 17 southern States between colleges for white students and institutions for colored students, usually on the basis of the white and colored school population, the negro institutions in these States receiving approximately 30 per cent of the appropriations. Large appropriations are also made to the colleges by the respective States for both maintenance and increase of plant, and the total income of the 67 institutions for the fiscal year ended June 30, 1912, was \$25,967,130.45.

Excluding the separate institutions for the colored race, the colleges of agriculture are of three main types: (1) The Massachusetts Agri-

cultural College, which offers only agricultural courses; (2) the 24 colleges with additional courses in the mechanic arts; and (3) the 25 which are colleges, schools, or departments of State universities. The college course in all of these institutions is four years in length and leads to a bachelor's degree. The requirements for admission and graduation vary greatly, but 35 require as much as the equivalent of a four-years' high school course for admission. The United States Bureau of Education found that in 1912 the average amount of time required during the four years in the various subjects was as follows: English, 227 hours; mathematics, 132 hours; modern languages, 205 hours; social sciences, 162 hours; natural sciences, 815 hours; agriculture, 800 hours; rural engineering, 161 hours; and electives, 535 hours. The electives included options in agriculture, agricultural sciences, natural sciences, and the humanities.

In 1912 there were nearly 11,000 students in the four-year agricultural courses, an increase of 272 per cent in five years. Nearly all of these institutions also offer graduate work in agriculture and in agricultural sciences leading to the master's degree, and 10 of them to the degree of doctor of philosophy. In 1912 there were 109 graduate students working for advanced degrees. Secondary schools of agriculture in addition to the college work are maintained by 17 institutions; 16 maintain one- or two-year courses of college grade; 40 conduct short winter courses at the institution. Practically all of them maintain extension departments giving instruction in agriculture to adults through correspondence courses, farmers' institutes, and "movable schools of agriculture." At least 36 colleges provide opportunity for their students to prepare for teaching agriculture, and summer schools primarily for rural teachers are conducted by 34 of them.

Under the Acts of 1862 and 1890 there have been established one agricultural college in each of the 48 States, Porto Rico, and Hawaii, besides the 17 separate institutions for negroes. Together with the affiliated agricultural experiment stations, the Office of Experiment Stations of the United States Department of Agriculture, and the United States Bureau of Education of the Department of the Interior, these institutions are organized into the Association of American Agricultural Colleges and Experiment Stations. This association was formed in 1887 and has done much to stimulate the development of agricultural education and research. It conducts a Graduate School of Agriculture, this being a four-week summer school for graduate work held every two years. The first session was at the Ohio State University in 1902, the second at the University of Illinois in 1906, the third at Cornell University in 1908, the fourth at the Iowa State College in 1910, the fifth at the Michigan Agricultural College in 1912, and the sixth at the University of Missouri in 1914. Dr. A. C. True served as dean of all six sessions. Special subjects have been featured at different sessions.

None of the separate institutions for the colored race are doing work of college grade. They enrolled nearly 2200 students in agricultural courses in 1912. About one-half of them are giving extension instruction to adults, and three-fourths of them are conducting summer schools.

Several other colleges in the United States

are giving instruction in agriculture. Among them may be mentioned Syracuse University, which in 1912 opened a department of agriculture, and Harvard University, which since 1870 has maintained the Bussey Institution, which gave undergraduate instruction in agriculture until 1908, and is now devoted to graduate instruction and research in applied biology. Approximately one-half of the State normal schools give elementary courses in agriculture, mainly for teachers who will be required to teach the subject in elementary schools. These courses are from six weeks to two years in length.

Special schools of agriculture of secondary or high-school grade other than those conducted by the agricultural colleges are maintained, supported in part by the State, in Alabama, Arkansas, California, Colorado, Georgia, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, New York, North Carolina, Oklahoma, Pennsylvania, Vermont, Virginia, and Wisconsin. There are approximately 100 such schools. Departments of agriculture in high schools have been established in many States, although the movement has made most headway where encouraged by a special State aid, notably in Massachusetts, Kansas, and Minnesota. Both the special schools and the agricultural departments in high schools are vocational in purpose. Probably more than one-fifth of all the public high schools in the United States are giving courses in agriculture, varying from four weeks to four years in length. In 1911, 1800 high schools reported to the United States Bureau of Education a total of 37,000 pupils studying agriculture; 831 of these schools reported a one-year course; 360 a course which extended over two or more years.

Instruction in agriculture is required by State legislation in all the elementary schools of Alabama, Arkansas, California, Florida, Georgia, Iowa (after 1915), Louisiana, Mississippi, North Carolina, Oklahoma, Tennessee, West Virginia, and Wisconsin. It is required in the rural schools of Missouri, North Dakota, Ohio, and Texas.

The movement for teaching agriculture through boys' and girls' corn clubs and other agricultural clubs is popular and widespread, especially in the Southern States. The club work is in some instances a definite part of the work of the school, and in other instances it is fostered by other agencies.

United Kingdom. The first institution giving systematic instruction in the theory and science of agriculture was the University of Edinburgh, where a chair of agriculture was established in 1790. A State-supported school of agriculture, the Albert Agricultural College, was established at Glasnevin, Ireland, in 1838. The Royal College of Agriculture at Cirencester, England, was opened in 1845. A professorship of rural economy was established at Oxford University in 1796, discontinued for many years, and reestablished in 1906. Among other institutions of higher education now offering systematic instruction in agriculture may be mentioned the university colleges of Reading, Leeds, Bangor, Manchester, and Aberystwith; the agricultural college of Harris Institute; West of Scotland Agricultural College; Armstrong College; Southeastern Agricultural College; Edinburgh and East of Scotland College of Agriculture; Royal College of Science, Dublin; Munster Institute, Cork; Durham College of Science;

Aberdeen and North of Scotland College of Agriculture, and the University of Cambridge. A professorship of agriculture was established at the last-named institution in 1899, and a special agricultural building, accommodating 100 students, was erected in 1910.

Financial aid for agricultural education is given by the government through the Board of Agriculture and Fisheries. In 1913 aid aggregating about \$95,000 was given to 7 universities and university colleges, 7 agricultural colleges, and 4 special institutions, and about \$35,000 was also available for farm schools under the county councils. There are also brief courses at migratory dairy schools, and day or evening lectures in agriculture, poultry-keeping, bee-keeping, etc. About \$60,000 per annum is expended for advisory work in agriculture, this supplementing the county funds for county agricultural advisers. Grants are also available under the Development Act of 1909 for agricultural education, research, farm institutes, etc.

Canada. The oldest and best known of the colleges of agriculture is the Ontario Agricultural College at Guelph, established in 1874. Other agricultural colleges are as follows: Manitoba Agricultural College at Winnipeg, Nova Scotia Agricultural College at Truro, and the agricultural colleges of the University of Saskatchewan at Saskatoon and the University of Alberta at Strathcona. In the Province of Quebec is the agricultural school at Anne de la Pocatière, a dairy school at St. Hyacinthe, and the Agricultural School at Oka now affiliated with Laval University. Macdonald College at St. Anne de Bellevue, near Montreal, now affiliated with McGill University, gives complete agricultural courses designed to prepare boys for farming. Agriculture is taught in many high and consolidated schools and in rural elementary schools.

Other British Possessions. In India the Imperial Agricultural College of India, endowed with \$150,000 by Henry Phipps of Pittsburgh and receiving financial aid from the imperial treasury, is situated at Pusa and includes a college, experiment station, and cattle-breeding farm. The agricultural school at Cawnpore has been made into a college. The Agricultural College of Coimbatore was established in 1905, and the Agricultural College of Lyallpur, Punjab, in 1910. Agricultural instruction is also given at the College of Science at Poonah and in many institutions of lower grade.

In Australia there are agricultural colleges at Gatton, Queensland; Richmond, New South Wales; Roseworthy, South Australia; and Dookie and Longerenong, Victoria. Agricultural instruction is also given at the University of Melbourne, in agricultural high schools, and by traveling experts attached to the Colonial Department of Agriculture. In New Zealand is the Canterbury Agricultural College at Lincoln; and in Cape Colony a school of agriculture at Elsenburg, as well as other institutions.

Belgium. The system of agricultural education includes the following institutions: *Colleges*—The State School of Veterinary Medicine at Brussels, the Agricultural Institute at Gembloux, and the Agronomic Institute of the University of Louvain. *Secondary Schools*—Three separate agricultural schools located at Carlsbourg, La Louvière, and Huy, and 16 agricultural schools conducted as departments of other educational institutions; courses in agronomy in

royal athenæums; State schools of horticulture at Ghent and Vilvorde, and private subsidized schools of horticulture at Mons, Liège, Tournai, and Carlsbourg. *Agricultural Schools for Women*—One higher agricultural school in connection with the Institute of the Sacred Heart and Immaculate Conception at Heverlé, and 10 secondary schools. In addition popular instruction is given in primary agricultural trades schools, also in itinerant schools for adults.

Denmark. The Royal Veterinary and Agricultural College at Copenhagen is a high-grade college supported in part by the Danish government. There are approximately 45 agricultural schools of secondary grade, one-third of which are separate institutions, the other two-thirds being associated with high schools. Only persons of from 18 to 25 years of age who have had at least one year's experience farming are admitted. Practically all the public high schools have given courses in agricultural science since their establishment. Agriculture is also taught in all the common schools.

Germany. Professorships in the agricultural sciences are maintained at many of the universities, e.g., Königsberg, Breslau, Halle, Göttingen, Leipzig, Rostock, and Jena, and approximately 2 per cent of the students are enrolled in agricultural courses. Other institutions teaching agriculture include the Agricultural High School of Berlin, the Technical High School of Munich, the Forestry Academy at Tharandt, and the Agricultural Academy at Bonn. There are 18 agricultural intermediate schools aided by the State, and many lower agricultural institutions, including farm and winter schools giving practical courses for farmers and farm boys.

France. The head of the French system of agricultural education maintained under the auspices of the national government is the *Institut National Agronomique* at Paris, in which instruction of university grade is given in agricultural science, supplemented by laboratory and field practice. There are three national schools of agriculture in which theoretical and practical instruction are combined, located at Grignon, Rennes, and Montpellier. A large number of secondary agricultural schools provide theoretical and practical instruction for the children of farmers, who at the same time perform all the work necessary to carry on the school farms. In some of the schools general agriculture is taught; others are devoted to special lines, such as viticulture, dairying, etc.

Since 1879 instruction in the elements of agriculture, horticulture, and natural history has been obligatory in the normal and primary schools of France. In each department of the country a professor of agriculture is appointed to prepare a course of instruction in agriculture for the normal schools, to hold farmers' meetings, and to maintain model fields for demonstrations. Chairs of agriculture have been established in many lyceums and colleges throughout France. The University of Toulouse has recently established an agricultural institute, giving a two-year practical and scientific course in agriculture. Special schools include the dairy schools at Mamirole and Surgères, the school of agricultural industries at Douai, the school of horticulture at Versailles, the poultry husbandry school at Gambias, the school of horse breeding at Le Pin, and a school of agriculture at Hennebont.

Other European States. Sweden has agricultural colleges at Ultuna and Alnarp, about 30 secondary schools, several dairy schools, and a corps of traveling instructors. Norway has an agricultural college at Aas and several secondary schools.

In Austria in 1911 there were 219 agricultural and forestry institutions, mainly of secondary and elementary grade or winter agricultural schools. Instruction is given to soldiers, as in several other European countries. Hungary maintains the Royal Hungarian Horticultural School at Budapest and the Agricultural Academy at Magyar-Ovar. Italy has agricultural colleges at Milan and Portici and about 30 general and special schools of secondary grade. Spain maintains educational institutions at Seville, Motril, Valladolid, Saragossa, Madrid, and other points.

The Russian system of agricultural education is organized for the most part under the Ministry of Agricultural and Imperial Domains. It includes agricultural institutes at the universities of Kazan, Kiev, and Moscow, similar institutions at Novoya Alexandria, Riga, St. Petersburg, and Mustiala (Finland), secondary schools, and elementary courses in public schools.

Other Countries. Nearly all the Central and South American countries now maintain agricultural schools, the most comprehensive systems having been developed in Argentina, Chile, and Brazil. Japan has several agricultural colleges, and schools have recently been established in Manchuria, Korea, and the Philippines. In fact, there is hardly a civilized country without provision for agricultural education.

AGRICULTURAL EXPERIMENT STATION. An institution, or department of an institution, devoted to scientific and practical investigations for the benefit of agriculture, the inspection of materials, animals, and plants used in or injurious to agriculture, and the dissemination of information on the theory and practice of agriculture. They grew out of the chemical studies of such men as Liebig in Germany, Boussingault in France, and Lawes and Gilbert in England during the first half of the nineteenth century. Systematic investigations in agriculture were begun by Lawes and Gilbert at Rothamsted, England, in 1843. The first experiment station organized as a public institution was established in 1851 at Möckern, near the city of Leipzig, Germany, and under the influence of Leipzig University. In the United States the first stations were established at Wesleyan University, Middletown, Conn., by the State of Connecticut, in 1875, under direction of W. O. Atwater, and about the same time at the University of California, Berkeley, Cal., by the university, under direction of E. W. Hilgard. Previous to this, agricultural investigations had been carried on at Yale University under Professors S. W. Johnson and William H. Brewer, at the Bussey Institution of Harvard University by F. H. Storer, and at agricultural colleges in several States. Agricultural experiment stations are now maintained in nearly all the countries of the world and are usually under the patronage of general or local governments.

Organization. In the United States Federal aid aggregating \$1,440,000 per annum is divided equally among the States for the maintenance of experiment stations. The Hatch Act of 1887 provides for \$15,000 per State per annum for carrying on original researches or

verification experiments relating to agriculture, and the Adams Act of 1906 a like amount in addition, but restricted to original investigation. For the fiscal year ended June 30, 1912, \$2,628,240.09 was also available from State governments and other sources. The total number of stations was 65, each State having at least one station. They employed 1574 persons in administration and inquiry, and issued that year 719 annual reports and bulletins, which were sent through the mails under frank to nearly 1,025,000 addresses. With few exceptions they are departments of the agricultural colleges established under the land-grant act (Morrill Act) of 1862 and are independent of each other as regards the planning and conduct of their operations. They are united in a national system through the Association of American Agricultural Colleges and Experiment Stations and the Office of Experiment Stations in the United States Department of Agriculture. This office exercises supervision of their expenditures from the national fund and gives them advice and assistance in many ways. It issues a monthly list of their current publications, summarizes the accounts of their work and that of kindred institutions throughout the world in the periodical known as the *Experiment Station Record*, and until 1913 gave popular *résumés* of their investigations in the *Farmers' Bulletin* series of the department, under the general title of *Experiment Station Work*. It also directly manages stations in Alaska, Hawaii, and Porto Rico, for each of which the national government appropriated \$30,000 in 1913, and in Guam, for which the appropriation was \$15,000.

Function. The operations of the stations cover a wide range of scientific and practical work relating to every branch of agriculture and horticulture and including original investigations, verification, and demonstration experiments, studies of natural agricultural conditions and resources, inspection and control service, and dissemination of information. Most of the stations are keeping meteorological records, and several are making special studies of problems relating to meteorological phenomena and climatic conditions. Forty-one are investigating soils, their geology, physics, and chemistry, or conducting soil tests with fertilizers or in other ways. Eighteen stations are studying questions relating to drainage and seepage, or to irrigation in the field or greenhouse, and also irrigation of orchard, garden, or farm crops, and five are taking up other rural engineering problems. All the stations are studying the more important crops, either with regard to their composition, nutritive value, methods of manuring and cultivation, and the best varieties adapted to individual localities, or with reference to systems of rotation.

Forty-eight stations are studying different methods of feeding and breeding animals. Thirty-four stations are investigating subjects relating to dairying, including the chemistry and bacteriology of milk and cream, butter-making, or the construction and management of creameries, and 24 have work with poultry. Forty-six stations are doing chemical work, and often are studying methods of analysis. Bacteriology is taken up by 22 stations. The same number are making investigations in systematic and physiological botany. Forty-three are studying plant breeding, and 41 the diseases of plants and methods for their eradication.

Fifty-one stations work to a greater or less extent in horticulture, testing varieties of vegetables and large and small fruits, and making studies in varietal improvement and synonymy.

Thirteen stations have undertaken operations in forestry. Thirty-nine stations investigate injurious insects with reference to their restriction or destruction. Forty stations study animal diseases and the methods for their prevention or cure. One or more stations have made investigations on miscellaneous subjects, such as the following: Dry farming; economic zoölogy; food and nutrition of man; bee-keeping; technology of wine, olive oil, cider, and vinegar; preservation of fruits and vegetables; the draught of farm implements; road-making; floriculture; the manufacture of beet, cane, sorghum, and maple sugar; home economics; oyster culture, etc.

Many of the stations also have a considerable amount of inspection work, 18 dealing with fertilizers, 14 with feeding stuffs, 5 each with nursery stock, insecticides and fungicides, seeds, and creamery glassware, 6 with foods and drugs, and 1 with paints. All of them give much attention to the dissemination of their results, many of them, in addition to publications, addresses, and correspondence, operating sub-stations and demonstration farms. Five have organized sections to coöperate with farmers.

Latin America. Experimental and demonstration work is under way in most Latin-American countries. Mexico has established 16 stations or test farms, Brazil 28, Argentina 8, and Chile 4. Other countries represented are Cuba, Dominican Republic, Honduras, Costa Rica, Salvador, British Guiana, Peru, Paraguay, and Uruguay.

British Empire. The Development Act of 1909 made available \$2,500,000 annually for five years for economic development, much of which is being used for aiding agriculture. A system of research institutes is being developed by grants to existing institutions. Thus plant physiology is fostered at the Imperial College of Science and Technology, plant pathology at the Royal Botanical Gardens (Kew), plant breeding at Cambridge University and the John Innes Institution, fruit growing at Bristol University, animal nutrition at Cambridge, animal pathology at the Royal Veterinary College, dairying at University College (Reading), economics of agriculture at Oxford University, and plant nutrition and soil problems at the Rothamsted Experimental Station. The Rothamsted station, established in 1843 by Sir John B. Lawes and maintained chiefly by private funds, is recognized as one of the foremost in the world. Agricultural researches are also carried on at most of the agricultural colleges and under the auspices of the Board of Agriculture, the Royal Agricultural Society of England, the Bath and West and Southern Counties Society, and a number of county education committees and councils.

In Scotland similar work is done by the Royal Highland and Agricultural Society of Scotland, the Agricultural Research Association of the Northeastern Counties, the Royal Botanic Garden at Glasgow, Mareschal College of Aberdeen University, and the Glasgow and West of Scotland Technical College; in Ireland, by the Department of Agriculture and Technical Instruction, Royal Dublin Society, Glasnevin Agricultural College, and Trinity College Botanic Gar-

dens (Glasnevin); in Wales, by the University Colleges of Wales and North Wales. In Canada the principal stations are the Central Experimental Farm at Ottawa, with 16 branches in the various provinces, and many sub-stations, test farms, etc., and the station at the Agricultural College of Guelph, Ontario. In the British West Indies stations for the improvement of sugar-cane are maintained on Barbados, Antigua, and Trinidad, and botanical stations on these and several other islands. In South Africa there is a government laboratory and herbarium at Cape Town, and stations at the agricultural school at Elsenburg and in Rhodesia. In India the Agricultural Institute at Pusa is the head of a system of provincial stations and a large number of sub-stations. Australia and New Zealand have about 50 stations.

Other Countries. Germany has over 100 stations, many of which are connected with universities. A considerable number of stations maintain inspection and control of fertilizers, feeding-stuffs, and seeds; others are for investigations in special subjects, such as brewing and distilling, milling, animal chemistry or physiology, veterinary science, dairying, plant diseases, and plant physiology. Among the most important German stations are those at Berlin, Halle, Bonn, Breslau, Darmstadt, Munich, Göttingen, Bernburg, Möckern, Posen, and Tharandt. France has about 100 stations and laboratories, of which the best known are those at Grignon, Juvisy, Montpellier, Paris, and Versailles. Austria, Belgium, Denmark, Holland, Hungary, Italy, Switzerland, Norway, Sweden, Russia, and Japan have from 10 to over 100 stations each. Spain, the Philippines, Greece, Portuguese and German East Africa, Belgian Congo, Gold Coast, and China have organized stations within the last 10 years. In 1910 a station was established by American Jews at Haifa, Palestine.

The total number of stations in the world is about 1000. An account of those in the United States was issued by the Office of Experiment Stations as *Bulletin 80* (1900), and similar data for those in other countries as *Bulletin 112* (1904). Subsequent progress is summarized yearly in the annual reports of the office.

AGRICULTURAL LABORERS. See LABOR PROBLEM; GANGS, AGRICULTURAL.

AGRICULTURE (tilling of land, Lat. *agri*, gen. of *ager*, field + *cultura*, tilling, cultivation). In a broad sense of the word, the science and art of the production of all plants and animals useful to man. More or less intimately connected with agriculture itself has been the preparation of its products for man's use. Again, the spinning of fibres and the weaving of cloth, the tanning of leather, the making of butter, cheese, wines, cider, vinegar, etc., have been largely done by farmers. Gradually, however, these occupations have been specialized and removed wholly or in part from the farm. Thus, the production of forest trees has been specialized as forestry, and the production of fruits, vegetables, and ornamental plants has formed the subject of horticulture. Such occupations as breeding live stock, raising poultry, bee-keeping, and fish culture are often also pursued independently of general agriculture. The term "agriculture" has, therefore, been gradually restricted to the production of a limited group of plants and animals, such as may be brought together on single farms in a system of mixed

husbandry. In the present article the term "agriculture" will be used in a somewhat broad sense, and the sketch will be confined to a brief outline of the historical development of agriculture, general statistics of a few of the more important agricultural products, and references to parts of the more general literature of agriculture. Information regarding particular plants and animals, or special agricultural industries, may be found in other articles in this ENCYCLOPÆDIA.

The Earliest Agriculture. Agriculture began in prehistoric times, when primitive man first began to select particular plants in his immediate environment as preferable to others for his use as food or for making his clothes, and when he first directed his efforts toward promoting the growth of plants. Whether these attempts preceded those to capture and confine animals, with a view to employing them as beasts of burden, or to using their meat, milk, or skins, we do not know. It is, however, clear that while the migratory habits of savage tribes must have tended to hinder anything like systematic cultivation of the soil, they probably did not prevent the domestication of animals.

The practices of some aboriginal tribes at the present time indicate that efforts to promote the growth of useful plants by the removal of other plants growing among them antedates the planting of seeds. Similar evidence points to the beginning of agricultural implements in the use of pointed and forked sticks to scratch the soil or remove obnoxious vegetation. The union of two such sticks with a leathern thong made a rude mattock or hoe, and a larger implement of the same kind formed the primitive plow, which was drawn, very likely, at first by men and afterward by domesticated animals. The great burden of agricultural labors was in those early ages undoubtedly thrown upon woman, as has been the case among the tribes of North American Indians, whose men have devoted themselves almost exclusively to the chase and to war. It is interesting to observe that severe military requirements still necessitate the employment of women in field labor on the Continent of Europe.

Egyptian Agriculture. The records preserved on ancient monuments allow us to trace the history of agriculture in Egypt back to at least 3000 B.C. At that early time various animals had already become domesticated, and the growing of crops for man and beast by a regular system of tillage and irrigation had been united with the feeding of large numbers of animals on the ranges. There was, however, no fixed distinction between wild and domesticated animals, and with certain kinds of animals the limits of domestication had not been definitely settled. The land and live stock were very largely the property of the royal, priestly, and military classes; the care of animals and the performance of farming operations were in the hands of hired laborers or slaves. Agriculture was, however, a more honorable occupation than trading or the mechanical arts. Herdsmen and fishermen were in the lowest class; swineherds especially were despised. Cattle, sheep, goats, and swine were kept, often in large herds and flocks. The cattle belonged to the same species as the present cattle of India. Both bulls and cows were used for labor, but the flesh of the males only was eaten. Sheep were kept for both wool and milk (from which

cheese was made), but do not appear to have been often used for food. Goats seem to have furnished the principal milk supply of ancient Egypt. Swine were raised in large numbers, though they were considered unclean and were forbidden food except on certain days or for the priests. The donkey and camel were the principal beasts of burden from prehistoric times. The donkey was probably first domesticated by the ancient Egyptians, being taken from the wild asses which came from their home at the headwaters of the Nile. Horses were brought into Egypt about 1900 B.C., when the Shepherd Kings from Asia conquered the country. The stallions only were used for war and for shows. They were kept in stables and fed on straw and barley. Water fowls, especially geese, were abundantly raised. Breeding of animals by selection was customary, as well as branding them for identification. "When the Nile overflowed, animals of all kinds were placed upon artificial raised ground and fed upon wheat straw and leguminous fodder raised for the purpose."

Crops were grown with the aid of the alluvial deposits annually made by the overflowing Nile and of irrigation to supply the lack of rainfall. Irrigation water was taken from the Nile and distributed through numerous canals and ditches. The water was raised to the top of the river bank by handsweeps such as are often used on farms to-day for raising water from shallow wells, or by means of a vessel held with straps between two laborers, who pulled against each other in lifting the water. In some cases seed was sown after the Nile flood without preparation of the land and was trodden in by animals. Generally the plow or the hoe was used. The plow consisted of a wooden plowshare, double handle, and draught pole or beam. "The beam and stilt were fastened together by thongs or by a twisted rope, which kept the share and beam at a proper distance and helped to prevent the former from penetrating too deeply into the earth." The plow was drawn by two bulls or cows, yoked by the shoulders or attached by the horns. Generally, one man held the plow and another drove the animals, but sometimes one man performed both duties. The hoe was made of wood and consisted of a rounded or pointed blade attached to a handle by a twisted thong. Other tillage implements sometimes used were the harrow and the roller. The cereals grown were bearded wheat, six-rowed barley, durra (*Andropogon sorghum*, var.), and millet (*Panicum miliaceum*). The seed was sown broadcast; the wheat and barley in November, after the subsidence of the Nile flood, and the durra either at that time or in April. Wheat was harvested in March, barley in April, and spring durra in July. "Wheat and barley were headed with a toothed sickle, or cut lower down and bound into sheaves." The grain was trodden out by donkeys or oxen on earthen threshing-floors constructed in the open field, where the chaff was fanned out by the wind. Granaries, often built of the Nile mud, were used for storage. Durra was pulled up by the roots, and the seed was removed with a comb-like stripper similar to that sometimes used now for removing broom-corn seed. Flax was raised from prehistoric times for its fibre, from which the clothing of the ancient Egyptians and the wrappings of the mummies were largely made. It is improbable that cotton was grown in

Egypt in very ancient times, though it seems to have been introduced there from the East previous to the beginning of the Christian era. Lentils, lupines (*Lupinus ternis*), onions, garlic, and radishes were commonly raised vegetables. The horse bean (*Vicia faba*), chick pea (*Cicer arietinum*), and bitter vetch (*Lathyrus sativus*) were also probably raised. For fruits the Egyptians had grapes, olives, figs, pomegranates, and dates. Other cultivated plants were the watermelon and castor-oil plant.

Babylonia. Of Babylonian agriculture there are few records. As in Egypt, it supported a dense population. The Euphrates overflowed, but did not do the work of the Nile. In all the region irrigation turns desert lands into fruitful fields. Of such fields Herodotus said: "This is of all lands with which we are familiar by far the best for growth of corn. When it produces its best it yields even three hundred fold. The blades of wheat and barley grow there to full four fingers in breadth; and though I well know to what a height millet and sesame grow, I shall not mention it, for I am well assured that to those who have never been in the Babylonian country what has been said respecting its productions will appear incredible."

Palestine. The Scriptures are full of allusions to the operations of the husbandman in Palestine, as well as in Egypt. The operations in the two countries necessarily formed striking contrasts, the crops in the former being dependent on the rains for growth, in the latter upon the inundations of the Nile. The Hebrews, before their sojourn in Egypt, had been a semi-pastoral people, and they must have learned something of Egyptian agriculture during the years of bondage. Their laws were those of an agricultural people. Land was practically inalienable. Extensive plains of fertile soil yielded the finest wheat. The hill-sides were covered with vines and olives, often planted in terraces formed with much labor to afford a large mass of soil in which the plants might flourish in the almost rainless summer. The valleys were well watered and afforded pasture for numerous flocks. Of the smaller cultivated plants, millet was the chief summer crop, but it was cultivated to only a limited extent, being confined to those spots that could be artificially watered. Wheat and barley were the chief cereals, as the winter rains were sufficient to bring them to maturity.

Greece. From the Grecian literature covering the period from 1000 B.C. to the conquest of Greece by Rome, 146 B.C., we get comparatively little definite agricultural information. In addition to the animals used in Egypt, mules were grown and used for labor. In winter, animals were housed. Swarms of bees were commonly kept. Wheat and barley were the cereals, and hemp, as well as flax, was raised. The fruits of Egypt, except the date palm, were grown, and in addition, cherries, plums, almonds, pears, apples, and quinces. The list of vegetables is also lengthened and includes turnips, beets, cabbage, lettuce, chicory, garden peas, and kidney beans. The common lupine (*Lupinus albus*) took the place of the species grown in Egypt and is said to have been used for green manuring. It is asserted that the Greeks introduced the use of manure to promote the growth of crops.

Rome. Roman agriculture has received special attention because so much was written about it by the Romans themselves, and because

they carried it into other countries, where it modified or dominated agricultural customs. When Rome was only a colony on the Tiber, land was divided among the citizens in small allotments. There was a domain of public land, which was continually extended by the conquests of neighboring States and the partial confiscations that followed. Although land in the conquered territory was sometimes granted to the poorer citizens, there were large tracts of public lands that were either cultivated or allowed to remain in pasture. The common conditions were that the occupants paid one-tenth of the produce of the corn lands, one-fifth of the produce of vines and fruit trees, and a moderate rate per head for cattle pastured. The occupants were merely tenants at will, and theoretically the State could resume or sell the lands at any time. Yet the right of possession was good against all until the lands had been resumed; and in process of time there came to be families so long in possession that they could not be dispossessed. Only the wealthy had the cattle or slaves that made such occupation possible. The burdens upon these occupiers of the public lands were much less than those upon the small farmers who owned their farms. Thus, at least two classes of cultivators were in existence, the small proprietors and the wealthy tenants holding the lands of the State. An addition to the strife between these two classes was the pressure brought to bear in the interest of the landless. Even after the Romans became masters of all Italy, little more than four acres was assigned to each citizen, and the domain lands increased enormously. Attempts were constantly made to restrict the extent of land that could be occupied by the wealthy, but generally without effect. (See AGRARIAN LAW.) A great deterioration and a consequent agricultural change took place during the century that followed the first Punic War (ended B.C. 241). The place of the small farmer was taken by the planter, who cultivated a great extent of territory, using slave labor. The small proprietors either sold their no longer profitable farms or were driven from them by the large land-holders. In Sicily, the first province, and in the others successively, the ownership of the land was vested in the Roman people. From these provinces came the tribute of grain that made grain-raising unprofitable in Italy. Hence the large estates were gradually given over to the keeping of flocks and the raising of cattle. Among the Roman writers upon agriculture were Varro, Columella, and Pliny. Earlier than these in time and more celebrated was Cato the Censor (died 149 B.C.), who gives us not only the most minute particulars regarding the management of the slaves on his large Sabine farm, but also all the details of husbandry, from plowing to the reaping and threshing of the crop.

Horses, asses, mules, cattle, sheep, and swine were raised by the Roman farmers, and much attention was given to the breeding of animals for special purposes. Castration was customary, and oxen were the principal work animals used on the farm. Mules were extensively used, especially as beasts of burden. The milk of sheep and goats was generally used for drink and also for making cheese. Columella describes a method of making and preserving cheese and says that the milk used in cheese-making was curdled in various ways, but commonly with a lamb's or kid's rennet. Poul-

try culture was an elaborate industry, and included the raising of hens, geese, ducks, teals, pigeons, turtle-doves, swans, and peacocks. Much attention was also given to fish culture, and such animals as hares, snails, and dormice were raised in considerable numbers. Wheat was the most important cereal crop cultivated by the Romans, and both smooth and bearded varieties were raised. Six-rowed and two-rowed barley, too, was grown to a considerable extent. Millet was grown to some extent. Oats and rye were introduced in comparatively late times. Land given to grain was fallowed for the whole of every alternate year. One-third of the fallow was manured and sown with some green crop as cattle food. Fallow received from four to five furrowings before the wheat was sown in the fall. The crop of wheat ripened about the middle of June, but the summers were too dry for the raising, with certainty, of millet and other summer crops. Alfalfa (lucerne), common vetch (*Vicia sativa*), bitter vetch, and chick pea were grown for fodder. Hemp, flax, beans, turnips, and lupines also are mentioned as occasionally cultivated. To the list of fruits and vegetables produced in ancient Egypt and Greece the Romans added apricots, peaches, melons, and celery. Meadows were carefully prepared, and rotation of crops was practiced to a certain extent. The soil was thoroughly cultivated with the plow and harrow or the hoe and rake; blind and open drains were used; in some regions irrigation was employed. Manures of different kinds were abundantly used, and various methods for their preservation and distribution were elaborated. Wheat and barley were usually reaped with a sickle, but sometimes they were pulled up by the roots, or the heads were cut off with shears. They were threshed with flails or with a board studded with iron spikes or sharp flints, which was drawn over the straw, or by trampling with cattle or horses. The Romans carried their agriculture into the ruder countries conquered by them. The vine growing wild in Sicily was carried into Gaul, where it was acclimated with difficulty. To the rude Britons the Romans taught agriculture so successfully that before the period of occupation was over they were exporting large quantities of grain.

The Dark Ages and the Middle Ages. The deterioration of Roman agriculture was accelerated by the overthrow of the Roman Empire. The conquering nations had advanced but little beyond the pastoral stage. During the following period of the Dark Ages the two influences working for the benefit of agriculture in western Europe were the Saracens in Spain and the religious houses in the other countries. The Saracens irrigated and tilled with untiring industry. They introduced the plants of Asia and Africa; cultivated rice, cotton, and sugar, and covered the rocks of southern Spain with fruitful vines. In general, throughout western Europe land was cheap and many worthless tracts were given to the Church. In some of the religious orders labor with the hands was imposed upon the members. They studied the works of the Roman writers upon agriculture and soon had the best cultivated lands in those countries through which their influence extended. Charlemagne encouraged the planting of vineyards and orchards. On the whole, the Crusades helped the agriculture of western Europe. In the latter part of the Middle Ages the people

of the low countries of western Europe came to be as distinguished for their agriculture as for their commerce and manufactures. They plowed in green crops; the people of Holland developed dairying; the Flemings gained the reputation of being the oldest practical farmers. Also in the plain of northern Italy, watered by the Po, agriculture was in an advanced condition. A large part of it, of great natural fertility, drew forth the praises of Polybius, who visited it about 50 years after it came into the hands of the Romans. In the thirteenth and fourteenth centuries, under the influence of irrigation, the region became a garden, supporting a large population and exporting grain. In the England of the same period the agriculture showed alternations of indolence and bustle, of feasting and semi-starvation. In August, 1317, wheat was 12 times as high in price as in the following September.

By the beginning of modern history, the fruitful lands of western Asia and southeastern Europe, swept by wars and desolated by conquest, had been placed under the ban of the Turk. The conquest of the Moors in Spain and their subsequent expulsion caused an injury to the agriculture of the peninsula which has not been repaired. The discovery of the New World showed two grades of agriculture carried on by those who had never seen the horse and were practically without domestic animals. Even the careful tillage of the ancient Peruvian had no influence upon Europe and little upon the America of succeeding centuries. The great contribution of America to the world's agriculture was the three plants, the potato, tobacco, and Indian corn or maize.

England. In the sixteenth century agriculture in England became more profitable, inclosures were made, and the rights of common were greatly restricted. Turned from the former wool exportation, the farmers began to raise wheat in large quantities to be sent out of the country. A law in the middle of the century practically prevented grain exportation and turned wheat lands into pasturage. The resulting high price of food and the destitution on the part of laborers brought another reaction and a replowing of grazing lands. The sixteenth century saw the end of the villeinage. In 1595 laborers without food during the summer months worked six days for a bushel of wheat, four days for a bushel of rye, and three and one-half days for a bushel of barley. Hops became an important crop. Gardening, greatly neglected in the first part of the seventeenth century, received due attention in the latter part. Deep drainage, too, began to be talked about. From the middle of the seventeenth century to the nineteenth, England looked to Flanders for the perfection of careful tillage. From the Flanders of the seventeenth century Sir Richard Weston brought turnips and red clover, and Arthur Young afterward called him a greater benefactor than Newton. By the end of the century turnips and clover were extensively cultivated in alternation with wheat. The cultivation of grasses was begun in this century with the introduction of perennial rye grass. White clover was introduced in 1700, and timothy and orchard grass came to England from America about 1760. The eighteenth century saw revolutions in English farming. One came when Lord Townsend established the Norfolk system. Under this system of first, wheat; second, turnips; third, barley; fourth,

clover and grass, one-half of the land was constantly under grain crops and the other under cattle-grazing. Large numbers of sheep and cattle were fattened on the turnips, and the consumption of roots on the land increased the yield of the barley. The Norfolk system was a success from the beginning. The rental of certain farms increased fivefold, and farmers in special cases made handsome fortunes. Susceptible of many modifications, it has had much to do with the improved agriculture of England. Beans, peas, and vetches were generally grown, often in mixtures with wheat or oats. Hemp was grown for rope-making. The common vegetables were onions, leeks, mustard, and peas, and among the fruits were apples, grapes, cherries, pears, and plums.

Another revolution came from the breeding experiments of Bakewell, commenced in 1760. To mention a single point, it had taken three or four years to prepare sheep for the market; those bred by Bakewell were prepared for the market in two years. Besides making a reputation and a fortune for himself, he made for others a way since followed in breeding. Jethro Tull, whose book on *Horse-hoeing Husbandry* appeared in 1733, was almost in touch with the methods of the nineteenth century. His theory was that seeds should be sowed in drills, and the spaces between the drills kept thoroughly cultivated. He invented a drill and a horse-hoe. He did not succeed in obtaining phenomenal crops, but successful modifications of the method have since been made.

North America. More agricultural progress had been made prior to the coming of the white man than is commonly supposed. Most of the Indians east of the western plains lived in settled villages and cultivated the soil. Indian corn was the chief food-stuff, and fully 1,000,000 bushels of ear corn were raised annually. Beans, squashes, pumpkins, sunflowers, tobacco, and gourds were among the 25 crops under cultivation. The Indians practiced seed selection, combated weeds, and sometimes manured their land with fish, shells, etc. In prehistoric times agriculture was carried on in the southwest with the aid of extensive reservoirs and dams, from 250,000 to 300,000 acres being irrigated in the Salt River valley alone. Hand irrigation is still practiced by the Pueblo Indians, who have raised cotton for hundreds of years.

The white colonists had much to discourage them as agriculturalists, and progress was slow. The land had for the most part to be cleared of forests. In New England the rigorous winters and stony soil were additional handicaps. From the Indians the settlers learned how to raise corn (maize), breaking the soil with a hoe and manuring with fish. Corn was the great product to be depended upon, although other grains were cultivated, and cattle and sheep increased slowly, fed first upon the native grass, then upon timothy, which was found to be specially fitted for New England soil. Enough flax was grown in 1642 to supply domestic needs in Massachusetts.

The Southern colonists, although more favored by nature, made less actual progress than those of the North. Tobacco for export to England became the most profitable crop, virgin land being cleared and abandoned when its fertility waned. Live stock flourished, and an export trade to New England began in 1640.

Cotton became a marketable product in 1620, although comparatively undeveloped until the invention of the cotton gin in 1793. Then began the reign of cotton, with a reliance upon slave labor, a demand for fresh fields, and a disregard of careful tillage. Early in the century the importation of the Spanish merino sheep changed the farming of the North and greatly increased the production of wool.

The Nineteenth Century. In the nineteenth century the progress of agriculture was profoundly affected by great general causes, some of which exerted a world-wide influence. Among these were: (1) the application of science to the improvement of agriculture; (2) the revolution in transportation methods through the use of steam power on land and sea; (3) the rapid opening of vast areas of new land in North and South America, Australia, and Africa to settlement, cultivation, and grazing; (4) the invention and extensive use of labor-saving machinery as applied to agriculture; (5) the abolition of serfdom and slavery; (6) the specialization of agricultural industries; (7) the organization of the distribution of agricultural products, and their use in manufactures in accordance with the modern business principles governing the organization of other great industries; (8) the establishment of governmental agencies for the promotion of agriculture; (9) the voluntary coöperation of farmers through numerous associations; and (10) the wide dissemination of public documents, and farmers' meetings. Scientific studies and experiments for the benefit of agriculture began early in the century, with its practical applications in the manuring of crops, the use of commercial fertilizers, etc. In more recent years a wide range of successful research on behalf of agriculture has been developed with the aid of the biological sciences, and in the closing years of the nineteenth century investigations in agricultural physics assumed great importance. The marvelous success of scientific effort, largely under government patronage, is one of the notable achievements of that century. Organized scientific research for the benefit of agriculture through experiment stations and kindred institutions became a regular and permanent agency for the advancement of this art.

The vital interest of the whole community in the success of agriculture as the great basal industry was distinctly recognized during the nineteenth century by the widespread establishment of governmental agencies for its promotion. Agriculture has now a definite place in the ministries of almost all the civilized nations of the globe. In the United States the Federal government maintains a Department of Agriculture, whose chief officer has had a seat in the President's cabinet since 1889 as the Secretary of Agriculture. Practically all of the States, too, have departments, boards, or commissioners of agriculture. Great Britain has a Board of Agriculture and Fisheries, organized in 1889, and a Development Commission, appointed in 1910. See AGRICULTURAL EXPERIMENT STATION; AGRICULTURE, UNITED STATES DEPARTMENT OF.

Agricultural Machinery. One of the features of the agricultural history of the past 50 years has been the extensive introduction of machinery. Sowing machines, cultivators, and

all the machines that displace the hoe are of comparatively recent invention. As early as 33 A.D., according to Pliny, the Gauls used a cart with projections in front which cut or tore off the heads of grain; but until recent times little effort was made to invent or introduce labor-saving machinery, owing to popular prejudice. The threshing machine was not invented until 1786, and though an attempt was made early in the century to construct reaping machines, but small success was won until the time of Bell, Hussey, and McCormick. (See REAPERS; REAPING.) In the hay harvest horse power is applied by means of the mowing machine, the hay-tedder, the rake, and machines for loading and unloading the hay. Another class of machines, as, for example, the one for threshing, deal with the gathered crops. The use of a system of machinery like that applied to dairying has made great changes in certain lines of agriculture. From horse power, too, there has been a partial change to power furnished by the steam, internal combustion, or gasolene engine, or, under special conditions, the windmill and electric motor. Even the small modern farm usually has something of the kind available for pumping water, filling the silo, running the cream separator and churn, etc., and the agricultural tractor and power-operated plows and harvesting machinery are becoming common in regions where farming is on an extensive scale. Improved farm machinery in America has made possible the rapid settling of the new States and the successful gathering of their immense harvests. (See HARVEST AND HARVESTING; FARM IMPLEMENTS; IMPLEMENTS, AGRICULTURAL; THRESHING AND THRESHING MACHINES; PLOW, PLOWING.) The Department of Agriculture found that the amount of human labor required to produce a bushel of wheat was on an average only 10 minutes in 1896, as compared with 3 hours and 30 minutes in 1830, and the cost of the human labor required to produce this bushel of wheat declined from 17¾ cents to 3½ cents.

System in Farming. There is a movement in agriculture to provide for local demands, to take advantage of growing centres of population, to strive for excellence and exact system in place of haphazard methods. The evaporator has broadened the fruit market. The canning industry has utilized fruits and vegetables and saved the agricultural balances in sections. Cold storage, rapid transportation, and the refrigerator car have reduced risks and shortened apparent distances. New Zealand is in the markets of London. Canada and the United States have a profitable apple trade with England. The expenses of transportation have been reduced to a fraction of the previous cost, and thus the wheat lands of Saskatchewan have been laid alongside those of both New England and old England, with gain for the one and with loss for the others. In dairying there has been one of the triumphs of recent agriculture. Specialization, with scientific method and improved machinery, has brought excellence without destruction of the market. Carried on largely as coöperative undertakings, creameries and cheese factories (see DAIRYING) have increased in Europe and America. A large industry in England, dairying on the coöperative basis has been on the increase in France. The Netherlands, famous for its careful agriculture, is a leading dairy country. Switzerland and Canada export

large quantities of cheese. Denmark no longer competes for the wheat trade, but has become one of the most successful of dairy countries, exporting immense quantities of high-grade butter to England.

Twentieth Century Agriculture. The census of 1910 showed 6,361,502 farms in the United States, with an average acreage of 138.1 acres, of which 75.2 acres was improved land. The aggregate value of farm property was \$40,991,449,090. Although the acreage increased only 4.8 per cent since 1900, the value of farm property rose 100.5 per cent, and that of land alone from \$15.57 to \$32.40 per acre. On the other hand, the rural population (49,344,883) increased by only 11.2 per cent as compared with an increase in the urban population (42,623,383) of 34.8 per cent. These figures illustrate some of the recent economic changes. With the practical exhaustion of the arable land in the public domain, and the consequent increase in price of farm lands, more intensive farming has become well-nigh indispensable.

The spread of the much-dreaded cotton boll weevil in the South has proved a blessing in disguise by bringing about diversification of crops, and this will be much accelerated when the eradication of the cattle tick allows animal husbandry and dairying to be developed to their full extent. The immense flocks and herds grazing on the open range have been replaced in many regions by fields of alfalfa, durum wheat, and other special crops adapted to irrigation or dry farming conditions, and this with the increase in population has brought about a virtual cessation of the export trade in cattle and contributed to the world-wide increase in the cost of living.

A great amount of intelligent work has been given to securing plants and trees suited to local conditions in different climates. Numerous varieties of all sorts of cultivated plants have been obtained through selection and otherwise, and in this way the areas devoted to different crops have been greatly extended. In the vicinity of the large cities market gardening has been a profitable branch of agriculture and has been the culmination of careful cultivation. Somewhat similar to it has been an industry which has developed in the United States under the name of "truck farming," carried on in places remote from markets. A large part of the vegetables consumed in the large American cities come from places from 500 to 1500 miles distant. According to the census reports of 1910 over 500,000 acres are given to vegetable growing on a considerable scale, and the annual return is over \$60,000,000. The South Atlantic States are especially interested in "truck farming," which, under favorable conditions, is generally very profitable. Other forms of special agricultural industries which have made great progress in recent years are the breeding of animals, fruit culture, poultry raising, and bee-keeping.

In speaking of the agriculture of the United States, besides branches touched upon, reference should be made to tobacco, which is grown widely; to the sugar-cane, grown chiefly on the alluvial lands of the Mississippi, and the sugar beet, to which large areas are given in Colorado, Michigan, California, and other States; to rice, grown profitably in the lowlands of certain Southern States; to the tropical and sub-tropical products of Florida and California; and to the

immense orchards of Oregon and other States of the Northwest.

In the West, since 1880, irrigation has been employed on a large scale in reclaiming land within the arid belt, a region extending from the centre of Kansas and Nebraska to the furthestmost Pacific Coast range of mountains. In that region of scanty rainfall 13,738,485 acres were irrigated in 1909, upon which crops valued at \$181,617,396 were grown. Under the National Reclamation Act reservoirs and other irrigation works are being constructed which will provide water for more than 2,000,000 acres, and irrigation is also being extended by private enterprise. Moreover, improved methods of cultivation are making it possible to grow crops by "dry farming" (i.e., without irrigation) on thousands of acres until recently considered irreclaimable. The success of irrigation in the West has led to a movement in the humid region to reclaim large areas of unproductive land by drainage, and the national government is beginning to assist in these enterprises. See IRRIGATION; ARTESIAN WELL.

The Commission on Country Life appointed by President Roosevelt reported in 1908, after an extensive survey, that in a general way the American farmer was more prosperous than ever before, but found that agriculture was still "not economically as profitable as it is entitled to be for the labor and energy the farmer expends and the risks he assumes." The three great needs were summarized as (1) effective coöperation to put him on a level with the organized interests with which he has to deal; (2) schools which will prepare children for country life, and (3) better means of communication. These conclusions epitomize twentieth-century conditions, and some of the lines along which improvement is being sought. Efforts are being made to increase agricultural credit facilities and to organize farmers for mutual betterment. (See AGRICULTURAL ASSOCIATIONS; COÖPERATION; CREDIT, AGRICULTURAL.) A system of agricultural instruction is being developed to educate the boy and girl back to, rather than away from, the farm. (See AGRICULTURAL EDUCATION.) Rural free delivery of mail and the parcel post, rural telephones, the automobile, and improved roads are decreasing the isolation of country life, and business men, educators, churches, etc., are joining hands with the farmer as never before to promote rural improvement as the foundation of American prosperity.

Other Countries. In Europe rural depopulation has become a most serious problem, and the related world-wide farm labor question has been of scarcely less importance. Efforts have been made in most European countries to remedy the situation by breaking up the large estates into small holdings and selling these under a system of deferred payments. In Great Britain about 200,000 acres have been allotted in this way.

The cultivation of the sugar-beet has become a prominent industry in Germany, Austria-Hungary, and Russia, these three countries growing nearly two-thirds of the world's supply. The vine is of importance in all the Mediterranean region and in favored localities like those along the German Rhine. Italy gives to the vine 10,000,000 acres, and France, with the lowest acreage in 1891, and larger before and since, gives on an average 4,000,000 acres. France,

dating its progress from the Revolution, has become one of the richest of agricultural countries, and previous to 1874 was the greatest wheat-producing country of the world. It is noted for its small farms and thrifty agricultural class, more than half of whom are land owners. Germany, the greatest potato-producing country of the world, is also a country of varied agricultural production. Austria-Hungary, only about half a century from serfdom, has a government that fosters agriculture and presents the sharp contrasts illustrated by the steam cultivator on large estates and the wooden plow on small farms. Russia, only 30 years from serfdom, shows agricultural methods in sharp contrast, with an immense agricultural production.

The garden of Italy is the Lombard plain, with its more than 1,600,000 acres of irrigated land and its careful systems of cultivation. Besides large crops of wheat, maize, grapes, and olives, Italy produces great quantities of lemons and oranges, and has more than half a million people engaged in raising silkworms. In Spain, despite over 3,000,000 acres each in grapes and olives, besides a large production of cereals and oranges, and the possibilities of irrigation and a succession of crops, agriculture looks backward to the time of the Moor.

China, with an agriculture unchanged from legendary times, and Japan are countries in which rude implements are overbalanced by irrigation, garden-like cultivation, and the most scrupulous care to conserve soil fertility and utilize every particle of human or animal wastes or other material of fertilizing value. With rice as a principal food product, they support a dense population, have a great variety of crops, and, together with India and Asiatic Russia, are increasing factors in computing the world's supply.

Egypt, under the guidance of England, is producing great amounts of sugar and a high-grade cotton. In 1913 Great Britain arranged a loan of \$15,000,000 to develop cotton growing in the Sudan.

Australasia has already developed beyond the pastoral stage, and besides cattle and sheep is exporting dairy and other products. Western Canada, with its virgin fields of wheat and oats, is becoming an important source of supply. In South America, Argentina is an important factor in the world's agricultural market, with its wheat, corn, wool, and cattle; and Brazil holds a leading place in the production of coffee. In Central America, including Mexico, the raising of cattle and sheep has become a large industry, and the exports of coffee, cocoa, and bananas are important. The West Indies and the Hawaiian Islands produce large quantities of cane-sugar.

The following table, prepared from the *Yearbook* of the United States Department of Agriculture, shows the amount of the principal agricultural products of different countries for the year 1912. Although these returns are not complete for all the countries, they furnish interesting data regarding the relative agricultural production of different regions. Of the world's wheat crop of about 3,760,000,000 bushels, the United States produces about one-fifth. The other chief wheat-growing countries are Russia, India, France, Austria-Hungary, Canada, Italy, Germany, Argentina, and Spain. The United States produces three-fourths of the world's

maize crop of 4,055,000,000 bushels, and more than two-thirds of the crop of 24,000,000 bales of cotton. Russia leads the world in the production of rye and barley, and in the yield of potatoes it is surpassed by Germany only. Outside of the United States most of the cotton is grown in India, China, and Egypt. Tobacco is an important crop in India, Austria-Hungary, Mexico, Japan, Germany, and France.

time and the year 1800 some 200 British authors wrote on agricultural topics. Among their works are Tusser, *Five Hundred Points of Good Husbandry*, etc. (1573); J. Tull, *Horse-hoeing Husbandry* (London, 1733); A. Young, *Annals of Agriculture* (London, 1813). In the United States few books on agriculture were published prior to 1800. Among these may be mentioned J. Eliot, *Agricultural Essays* (Boston, 1760);

AGRICULTURAL PRODUCTS OF THE WORLD, 1912

COUNTRY	MILLION BUSHEL						MIL- LION BALES	MILLION POUNDS		MIL- LION TONS
	Wheat	Corn	Rye	Barley	Oats	Pota- toes*	Cot- ton*	Rice*	To- bacco*	Sugar
AFRICA:										
Algeria.....	28	....	....	33	12	2	..	.....	19	..
Tunis.....	4	....	....	5	2	....	..	.....	....	..
Egypt.....	32	70	....	....	....	....	2	523	....	..
Union of South Africa...	3	20	....	3	4	2	..	.....	14	..
Madagascar.....	....	....	....	....	....	....	..	953	....	..
All Countries.....	66	90	....	41	18	4	2	1,478	36	..
AMERICA:										
Argentina.....	166	296	....	....	69	19	..	19	15	..
Brazil.....	....	....	....	....	....	....	..	185	41	..
Canada.....	199	17	3	44	362	66	..	.....	17	..
Chile.....	20	4	....	....	2	7	..	.....	....	..
Cuba.....	....	....	....	....	....	....	..	.....	70	2
Mexico.....	12	....	....	7	....	1	..	125	35	..
Uruguay.....	6	1	....	....	2	....	..	.....	....	..
United States.....	730	3,124	36	224	1,418	293	16	663	915	1
All Countries.....	1,137	3,441	39	275	1,853	387	16	1,210	1,151	4
ASIA:										
Asiatic Russia.....	103	....	33	12	95	33	1	363	35	..
China.....	....	....	....	....	....	....	1	47,204	18	..
India, etc.....	368	....	....	....	....	....	3	81,298	450	2
Japan.....	25	....	....	91	....	25	..	16,240	96	1
Turkey.....	35	....	....	....	....	....	..	137	....	..
Australasia.....	81	9	....	3	20	18	..	5	2	..
All Countries.....	630	9	33	108	116	76	6	170,759	827	5
EUROPE:										
Austria-Hungary.....	257	230	177	149	231	620	..	.....	183	1
Belgium.....	15	....	23	4	38	105	..	.....	22	..
Bulgaria.....	45	31	10	15	12	....	..	7	23	..
Denmark.....	4	....	19	23	42	30	..	.....	....	..
France.....	335	17	51	51	329	424	..	1	40	..
Germany.....	160	....	457	160	587	1,263	..	.....	64	1
Greece.....	7	....	....	....	....	....	..	3	17	..
Italy.....	166	99	5	8	28	62	..	652	25	..
Netherlands.....	5	....	16	4	16	103	..	.....	2	..
Norway and Sweden....	8	....	24	17	88	75	..	.....	2	..
Portugal.....	8	15	....	....	....	....	..	.....	....	..
Roumania.....	89	105	4	21	21	6	..	.....	21	..
Russia.....	624	80	1,011	452	972	1,143	..	.....	160	2
Servia.....	14	27	2	4	5	2	..	.....	4	..
Spain.....	110	25	19	60	23	93	..	287	....	..
Switzerland.....	3	....	....	....	....	47	..	.....	1	..
Turkey.....	18	....	....	....	....	....	..	1	49	..
United Kingdom.....	59	....	2	60	180	281	..	.....	....	..
All Countries.....	1,926	630	1,830	1,035	2,598	4,282	..	952	613	6
ALL COUNTRIES.....	3,760	4,055	1,901	1,458	4,585	4,749	24	174,405	2,627	16

* Yield for 1911.

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S. Deane, *New England Farmer, or Georgical Dictionary* (Portland, 1797); B. Vaughan, *Rural Socrates* (Hallowell, 1800). During the nineteenth century the number of English and American works on agriculture greatly increased, and not only did the general treatises become more thorough and scientific, but also a large amount of valuable literature on special subjects was published. Only a few books of more general importance will be mentioned here: J. C. Loudon, *Encyclopædia of Agriculture* (London, 1825); J. C. Morton, *A Cyclopædia of Agriculture* (London, 1850-52); *Handbook of the Farm* (London, 1868); J. Periam, *The American Encyclopædia of Agriculture* (Chicago, 1881); L. H. Bailey et al., *Cyclopædia of American Agriculture* (New York, 1907-09);

C. E. Green and D. Young, *Encyclopædia of Agriculture* (Edinburgh and London, 1907-09); R. P. Wright, *The Standard Cyclopædia of Modern Agriculture and Rural Economy* (London, 1907-10); E. V. Wilcox and C. B. Smith, *Farmers' Cyclopædia of Agriculture* (New York, 1904); *Cyclopedia of Live Stock* (New York and London, 1908); L. H. Bailey, *Rural Science Series* (New York, 1895); Bailey and Miller, *Encyclopædia of American Horticulture* (4 vols., New York, 1900-02); H. Stephens, *Book of the Farm* (London, 1855); R. Wallace, *Farm Live Stock of Great Britain* (Edinburgh, 1885); E. B. Voorhees, *First Principles of Agriculture* (Boston, 1896); *Forage Crops* (New York and London, 1909); W. P. Brooks, *Agriculture* (Springfield, Mass., 1901); F. S. Earle, *Southern Agriculture* (New York, 1908); J. A. Widtsoe, *Dry Farming* (New York, 1911); G. F. Warren, *Elements of Agriculture* (New York and London, 1909); F. H. King, *Farmers of Forty Centuries* (Madison, Wis., 1911); S. W. Johnson, *How Crops Grow* (New York, 1868; London, 1869); *How Crops Feed* (New York, 1870); A. D. Wilson and C. W. Warburton, *Field Crops* (St. Paul, 1912); A. Agee, *Crops and Methods of Soil Improvement* (New York, 1912); J. B. Davidson, *Agricultural Engineering* (St. Paul, 1913); H. C. Taylor, *Agricultural Economics* (New York and London, 1907); T. N. Carver, *Principles of Rural Economics* (Boston and London, 1911); T. F. Hunt, *How to Choose a Farm* (New York and London, 1906); G. F. Warren, *Farm Management* (New York, 1913); G. H. Powell, *Coöperation in Agriculture* (New York, 1913); J. L. Coulter, *Coöperation among Farmers* (New York, 1911); K. L. Butterfield, *Chapters in Rural Progress* (Chicago, 1908); L. H. Bailey, *The Country Life Movement* (New York, 1911); J. M. Gillette, *Constructive Rural Sociology* (New York, 1913); Mabel Carney, *Country Life and the Country School* (Chicago, 1912); W. H. Wilson, *The Evolution of the Country Community* (Boston, 1912). History of Agriculture: G. Rawlinson, *Ancient Egypt* (London, 1887); C. G. B. Daubeny, *Lectures on Roman Husbandry* (Oxford, 1857); C. W. Hoskyns, *Short Inquiry into the History of Agriculture* (London, 1849); W. H. R. Curtler, *A Short History of English Agriculture* (Oxford, 1909); J. E. T. Rogers, *History of Agriculture and Prices in England* (Oxford, 1882); R. E. Prothero, *English Farming, Past and Present* (London, New York, etc., 1912); R. C. Flint, *One Hundred Years' Progress*, Report Department of Agriculture (Washington, 1872).

Several hundred agricultural journals are being published, widely distributed over the world. A few of the most important are the following: United States: *The American Agriculturist* (New York); *Breeder's Gazette* (Chicago); *California Cultivator* (San Francisco); *Country Gentleman* (Philadelphia); *Farm and Ranch* (Dallas, Texas); *Farmers' Mail and Breeze* (Topeka); *Hoard's Dairyman* (Fort Atkinson, Wis.); *Pacific Rural Press* (San Francisco); *Rural New Yorker* (New York); *Southern Planter* (Richmond, Va.); *Wallaces' Farmer* (Des Moines, Iowa). West Indies: *West Indian Bulletin* (Barbados). South America: *Revista Zootecnia* (Buenos Aires). Great Britain: *The Agricultural Gazette* (London); *Farmers' Gazette* (Dublin); *Field, Farm, and Garden* (London); *Gardeners' Chronicle* (London); *Mark Lane Express* (London); *Scottish*

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AGRICULTURE, UNITED STATES DEPARTMENT OF. The department was established as a separate branch of the government in 1862. It grew out of a voluntary distribution of seeds, begun by the Commissioner of Patents in 1836. In 1839 Congress made an appropriation of \$1000 "to be taken from the Patent Office fund for the purpose of collecting and distributing seeds, prosecuting agricultural investigations, and procuring agricultural statistics." Small amounts were thus drawn from that fund annually (except in 1840, 1841, and 1843) up to 1854, when the whole amount was reimbursed and a separate appropriation was made for the agricultural work of the Patent Office. That year an entomologist was employed, and in 1855 a chemist and a botanist were added to the staff, and a propagating garden was begun. After separation from the Patent Office, the chief officer of the department was styled Commissioner of Agriculture. He was not a member of the President's cabinet until 1889, when he became Secretary of Agriculture. The first Commissioner was Isaac Newton of Pennsylvania, and the first Secretary, Norman J. Colman of Missouri, who was also the last Commissioner. The succeeding secretaries have been Jeremiah M. Rusk of Wisconsin, J. Sterling Morton of Nebraska, James Wilson of Iowa (1897-1913), and David F. Houston of Missouri. In recent years the activities of the department have been widely extended. Its personnel numbers over 14,000 employees, and its funds for the fiscal year ended June 30, 1913, aggregated \$22,656,496. Its main buildings are in Washington, but though augmented by the completion in 1908 of two four-story wings of a proposed huge departmental building at a cost of \$1,500,000, accommodate only a fraction of the employees. Its equipment also includes three farms comprising nearly 1000 acres in Maryland and Virginia, and numerous branch laboratories, etc., in various parts of the country. The department library of over 122,000 books and pamphlets is considered the largest agricultural library extant.

As defined in the act of establishment, the duties of the department are "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants." The present functions of the department may be classified as (1) administrative, (2) advisory, (3) investigational, (4) informational, and (5) educational. With the progress of agricultural science the department has become one of the greatest

scientific establishments in the world. Its administrative functions also have been materially enlarged in recent years and reach vitally the daily life of every citizen. Much attention is given to disseminating results. In 1912 the department issued 2110 publications aggregating 34,678,557 copies. Many of these were technical reports of scientific investigations in limited editions for libraries, agricultural colleges, and experiment stations, scientific institutions, and persons coöperating in the work of the department, but also sold by the Superintendent of Documents at cost. The *Year-book* (edition 500,000 copies) and the series of *Farmers' Bulletins* are distributed gratis, largely through members of Congress. Monthly lists of publications of the department and the State experiment stations are sent free to all applicants. Periodical publications of the department are the *Experiment Station Record*, *Monthly Weather Review*, and beginning with 1913 the *Journal of Agricultural Science*, in which are published results of the department's research work. A series of departmental bulletins contains less technical material and has been substituted for the series of bulletins and circulars formerly issued by each bureau. The department also conducts a vast and varied correspondence and is employing a large number of experts to give personal advice to farmers in districts where they are located.

The present organization and main lines of work of the department are shown in the following table:

ORGANIZATION AND WORK OF UNITED STATES DEPARTMENT OF AGRICULTURE, 1913

Division	Scientific and technical work	Administrative work
OFFICE OF THE SECRETARY.		Supervision of all public business relating to the agricultural industry; appointment and supervision of department officers and employees; care of department grounds, buildings, supplies and other property; direction of legal work of the department.
WEATHER BUREAU.	Researches in climatology and meteorology.	Forecasting weather; warning against storms, frosts, and floods; maintenance and operation of seacoast telegraph lines and collection and transmission of marine intelligence.
BUREAU OF ANIMAL INDUSTRY.	Researches on animal diseases, including chemical, bacteriological, and zoölogical investigations. Investigations in dairying, animal breeding, and feeding.	Inspection of import and export animals and vessels for their transportation; supervision of interstate movement of cattle and inspection of live stock and their products after slaughter for food consumption; eradication of Texas fever and other animal diseases; supervision of serums for use with animals; management of experimental farms at Beltsville and Bethesda, Md.

ORGANIZATION AND WORK OF UNITED STATES DEPARTMENT OF AGRICULTURE, 1913—(Continued)

Division	Scientific and technical work	Administrative work
BUREAU OF PLANT INDUSTRY.	Researches in economic botany, physiology, and diseases of plants and forest trees; plant breeding; soil bacteriology; biophysics; acclimatization and adaptation of plants. Farm management investigations; demonstration work with farmers in improved farm practice; studies of agriculture under dry-land, irrigation, and other special conditions. Collection and testing of seeds and plants from foreign countries.	Purchase and distribution of seeds, largely through members of Congress. Testing of imported and domestic seeds. Establishing standard grades of grain and cotton. Care of department park and conservatories. Management of Arlington Experimental Farm.
BUREAU OF CHEMISTRY.	Researches in agricultural chemistry, bacteriology and physiology, especially with foods, drugs, waters, leather, paper, feeding stuffs, insecticides, and fungicides; enology; methods of analysis, etc.	Inspection of foods and drugs imported or entering interstate commerce. Miscellaneous analyses for the department. Testing supplies for other departments.
BUREAU OF SOILS.	Investigation, classification, survey, and mapping of soils; studies in soil chemistry and physics; soil fertility; explorations to discover sources of natural fertilizers.	
OFFICE OF EXPERIMENT STATIONS.	Collection and dissemination of information regarding agricultural education and research in the United States and abroad. Investigations on food and nutrition of man and on irrigation and drainage.	Supervision of expenditures of agricultural experiment stations in the United States; maintenance of experiment stations in Alaska, Hawaii, Porto Rico, and Guam.
FOREST SERVICE.	Researches on natural history and utilization of forests.	Control of National Forests and economic management of forests, including fire protection, timber sales, grazing control, and reforestation. Coöperates with States in fire protection of headwaters of navigable streams.
BUREAU OF BIOLOGICAL SURVEY.	Researches on geographic distribution of animals and plants; mapping of life zones; studies of food habits of birds and mammals.	Administers laws regulating the importation of foreign birds and animals. Protection of game by control of interstate trade. Protection of migratory and insectivorous game birds. Supervision of quarantine to prevent spread of gypsy and browntail moths.
BUREAU OF ENTOMOLOGY.	Researches on insects affecting agriculture and forestry, including means of repression of insects injurious to crops, animals, and man; introduction of beneficial insects; promotion of apiculture.	

ORGANIZATION AND WORK OF UNITED STATES DEPARTMENT OF AGRICULTURE, 1913—(Continued)

Division	Scientific and technical work	Administrative work
OFFICE OF PUBLIC ROADS.	Collection and dissemination of information regarding road management; experiments in road making and road improvement; tests of road materials.	
DIVISION OF PUBLICATIONS.	Editing of department publications, especially the <i>Year-book</i> .	Supervision of department printing and illustrations; distribution of publications.
BUREAU OF STATISTICS.	Collection and dissemination of agricultural statistics, especially crop reports for the United States and foreign countries. Economic studies of agricultural production and distribution.	
DIVISION OF ACCOUNTS AND DISBURSEMENTS. LIBRARY.		Supervision of fiscal affairs of the department. Supervision of department library.
RURAL ORGANIZATION SERVICE.	Researches in problems of rural organization, including studies of marketing and distributing farm products and bettering country life.	
REFEREE BOARD OF CONSULTING SCIENTIFIC EXPERTS.	Researches on scientific questions involved in the food and drug inspection.	
BOARD OF FOOD AND DRUG INSPECTION.		Considers administrative questions in administration of food and drugs act.
INSECTICIDE AND FUNGICIDE BOARD.		Administers the act for inspection of insecticides and fungicides.
FEDERAL HORTICULTURAL BOARD.		Administers the act for inspection and quarantine of diseased or infested plants.

AG'RIGEN'TUM (Lat. name for the Gk. *Ἀκράγας*, *Akragas*). The modern Girgenti, a town on the southern coast of Sicily, in lat. 37° 17' N., and long. 13° 28' E., founded by a colony from Gela (582 B.C.), once one of the most important places in the island. During the sixth and fifth centuries B.C., under various rulers, among them the tyrant Phalaris (q.v.) and Theron (q.v.), it rose to great power and splendor, having a population of 200,000. It was utterly destroyed by the Carthaginians (405 B.C.), and it never fully recovered. In the course of the Punic Wars it was compelled to submit to the Romans. From 825 to 1086 A.D. it was in the possession of the Saracens, from whom it was conquered by Count Roger Guiscard. The modern Girgenti had (1901) 25,024 inhabitants and is the capital of the province of the same name. The ancient walls can still be traced, and there are a number of picturesque remains of temples and other buildings of the Greek period. The best preserved are the temple of Concord and the so-called temple of Hera Lacinia; the largest is the unfinished temple of Zeus. There

are ruins also of an imposing Greek theatre. It was the birthplace of Empedocles (q.v.).

AG'RIMONY (Lat. *agrimonia*, for Gk. *ἀργεμώνη*, *argemōnē*, a kind of poppy). The common name of the genus *Agrimonia*, which includes about 15 species, and belongs to the family Rosaceæ. The common agrimony (*Agrimonia eupatoria*) is a native of Europe, and is represented in the United States by closely allied species growing in borders of fields, on waysides, etc. The plants are perennial herbs, with pinnate leaves, clusters of yellow flowers, and a calyx-tube with hooked bristles in the throat. The original species (*Agrimonia eupatoria* of Europe), like its American relatives, has a pleasant, slightly aromatic smell, and is bitter and styptic. A decoction of it is used as a gargle; the dried leaves form a kind of herb tea, and the root has some celebrity as a vermifuge.

AGRIP'PA. See under HEROD.

AGRIPPA, MARCUS VIPSANIUS (63-12 B.C.). A Roman general and statesman. Though not of high birth, through his own talents he rose to an exalted position. He first married Marcella, the niece, and then Julia, the daughter, of Octavianus (Augustus). He was eminent both in war and in peace; and as a general, counselor, and friend of the Emperor, did good service to him and to the Roman State. As a general, especially by his naval victories between Mylæ and Naulochus, in Sicily, 36 B.C., he laid the foundation for the sole dominion of Octavianus and commanded his fleet in the battle of Actium (q.v.). He was generous, upright, and friendly to the arts; Rome owed to him the restoration and construction of several aqueducts, and the erection of the Pantheon, besides other public works of ornament and utility. By his first wife he had a daughter Vipsania, the first wife of Tiberius, afterward Emperor; by Julia he had two daughters, Julia and Agrippina (q.v.), wife of Germanicus (see GERMANICUS CÆSAR), and three sons, Gaius Cæsar, Lucius Cæsar, and Agrippa Postumus.

AGRIPPA VON NITTESHEIM, HENRICUS CORNELIUS (1486-1535). A cosmopolitan physician, philosopher, and writer, whose genius and learning had a tinge of quackery. He was born at Cologne, Sept. 14, 1486. At the age of 20 he was sent by Emperor Maximilian on a diplomatic mission to Paris. At 23 he was teaching theology at Dôle, in the Franche-Comté. Here he attacked the monks, who replied with an accusation of heresy. In 1510 he reëntered the diplomatic service, and the next year he attended, as theologian, the schismatic Council of Pisa. In 1515 he lectured at Pavia, where he received a doctor's degree in law and medicine; then, after some years in diplomatic service, he became involved once more in controversy with the Church, for his bold defense at Metz of a woman accused of witchcraft. He practiced medicine at Geneva, Freiburg, and Lyons, and, under pressure of poverty, composed a keen Latin satire on the existent state of science, *A Declamation on the Uncertainty and Vanity of the Sciences and Arts, and on the Excellence of the Word of God* (*De Incertitudine et Vanitate Scientiarum*, etc.) (1527), which furnished new occasion for malicious accusation. In 1529 he quarreled with the Queen-mother Louise of Savoy, and left Lyons for the Netherlands, to become historiographer of the Emperor Charles V, of whose reign he wrote a history. His salary was unpaid, and he was imprisoned and finally banished

from Cologne for debt. He found a brief refuge at Grenoble, where he died, Feb. 18, 1535, only to be pursued in the grave by a spiteful epitaph from his Dominican enemies. Agrippa was a man of clear sight and keen wit; but he lacked stability, seriousness, and discretion. Though engaged in controversy with the monks, he remained a Catholic. His *Works* appeared at Lyons in two volumes (1550). They are analyzed in Henry Morley's appreciative *Life of Agrippa* (London, 1856). Noteworthy are Agrippa's *De Occulta Philosophia* (1510), which gives an account of the Cabbala (q.v.) and defends magic; and *De Nobilitate et Præcellentia Faminei Sexus* (1532). The latest life of Agrippa is that of Prost, *Corneille Agrippe* (Paris, 1881).

AG'RIPPI'NA. 1. The daughter of M. Vip-sanius Agrippa (q.v.) and Julia, daughter of Augustus. She was one of the most heroic and virtuous women of antiquity. She was married to Germanicus (see GERMANICUS CÆSAR), whom she accompanied in all his campaigns. Tiberius, who hated her for her virtues and the esteem in which she was held by the people, banished her to the island of Pandataria, near Naples, where she voluntarily died of hunger (33 A.D.). 2. The daughter of the last mentioned (c.15-59 A.D.), and one of the most detestable women that ever lived. In her second widowhood she induced the Emperor Claudius, her own uncle, to marry her and caused his daughter, though she was already promised to another, to be betrothed to her son Nero. In order to bring the latter to the throne, she ruined many rich and noble Romans, excluded Britannicus, the son of Claudius by Messalina, from the succession, and finally poisoned the Emperor, her husband. She then endeavored to govern the Empire through her son Nero, who was proclaimed Emperor; but, her ascendancy proving intolerable, Nero caused her to be put to death (59 A.D.). She enlarged and adorned her native city, Cologne, which received from her the name of Colonia Agrippinensis.

AG'ROPY'RON (literally, field-wheat. Gk. *ἀγρός*, *agros*, field + *πυρός*, *pyros*, wheat). A genus of grasses including about 50 species, most of which are perennials. A number are native to the western United States, where they are commonly known as wheat grasses and are held to be valuable for pasturage. Other species are common to Europe and the eastern United States, where *Agropyron repens*, often called couch grass and twitch grass, is a pest to agriculture. It has a long rhizome that roots at the nodes, and if plowed or harrowed it merely breaks up into new plants. Therefore it is hard to eradicate. Upon the western ranges, however, it is deemed a good hay grass. The habits of the plants enable them to withstand drought, a characteristic that commends them in the large stock regions. Some of the valuable species are *Agropyron caninum*, bearded wheat grass; *Agropyron divergens*, wire bunch grass; *Agropyron pseudo-repens*, western couch grass; *Agropyron spicatum*, western wheat grass; and *Agropyron tenerum*, slender wheat grass. In Australia *Agropyron scabrum* is considered a good winter grass. Some of the species, as *Agropyron repens*, are recommended as binder grasses for railroad embankments and other places liable to washouts. The root stalks of *Agropyron repens*, well known in medicine under the name *Radix graminis*, have diuretic and aperient properties.

AGTELEK, ög'tě-lěk, or **AGGTELEK**. A village of Hungary, in the county of Gömör, about 40 miles west-southwest of Kaschau. It is known for its remarkable stalactite cavern, called *Baradla* (steaming-place), the largest in the world after the Mammoth Cave in Kentucky. It is entered through an opening scarcely 3 feet high by 5 feet wide. It consists of a labyrinth of caverns communicating with one another, whose combined length is more than 5 miles. The largest of them is over 900 feet long and more than 90 feet in height and breadth. Many of the stalactitic formations are of singular and fantastic shape, giving rise to the names borne by some of the grottoes, such as the Cathedral, Paradise, Flower Garden, etc.

AGUA, ä'gwá. A South American toad (*Bufo marinus*) ranging from the Antilles to Argentina. It is the largest toad known, being sometimes 8 inches long, the skin dark brown and rough with warty glands. The voice of the male is a loud, snoring bark. It became a pest a few years ago in Jamaica, where it was introduced in 1844 as an enemy to the rats, which were devouring the sugar-cane. It multiplied excessively and, although it destroyed young rats, became a nuisance by its numbers, nocturnal bellowings, and destruction of ground-birds, chickens, and eggs. It has since become less numerous and troublesome. See illustration on Colored Plate accompanying TOAD.

AGUA, VOLCÁN DE, vól-kán' dā ä'gwá. A volcano in southern Guatemala, Central America (Map: Central America, B 3). It is over 12,000 feet high, and has a crater about 90 feet in diameter, from which streams of hot water are occasionally ejected, whence its name. Northwest of Agua are situated the volcanoes of Pacoya and Fuego. The old town of Guatemala was destroyed in 1541 by the hot-water eruption of Agua.

AGUADA, ä-gwä'dá. A village in the north-western part of Porto Rico near the shore of Aguadilla Bay. It was founded in 1511 and claims to be the oldest settlement on the island. Tradition says that Columbus landed here in 1493. The town contains churches and schools and is surrounded by excellent farm land. The raising of sugar-cane is the most important industry. The hurricane in 1899 wrought great havoc in the neighborhood. Pop., 1910, 909.

AGUADILLA, ä'gwä-dě'lyá. The chief town of the municipality of the same name (pop., 1910, 21,419), situated on the western coast of Porto Rico (Map: Porto Rico, A 2). It has a fine bay, contains an old church and a fort, and is famous for its fruits and flowers. Coffee, cocoanuts, sugar, and tobacco are grown and exported, and rum is distilled. It was founded in 1775 and unsuccessfully attacked by the British in 1797. Pop., 1899, 6425; 1910, 6135.

AGUADO, ä-gwä'dô, ALEJANDRO MARÍA, MARQUIS DE LAS MARISMAS DEL GUADALQUIVIR (1784-1842). A celebrated Spanish financier of Jewish descent. He was born in Seville, and in Paris became one of the wealthiest bankers of modern times. During the Spanish War of Independence he fought with distinction with those who supported Joseph Bonaparte. Exiled in 1815, he went to Paris and engaged in the Cuban and Mexican trade and in banking. Beginning in 1823, he negotiated four Spanish loans, thus saving Spain from bankruptcy. In return, Ferdinand VII ennobled him and gave him mining and other concessions. He was

naturalized in France in 1828, and at his death left a fortune of more than 60,000,000 francs and a splendid collection of pictures.

AGUARA, ä'gwä-rä', or **GUARA**, gwä-rä' (native name). A Brazilian native name confusingly applied in books to various South American animals, perhaps most strictly to the crab-eating dog (*Canis cancrivorus*) of Guiana. In the valley of the Rio de la Plata Azara's fox-dog is called "Aguará chay," and the maned wolf "Aguará guazu." See **FOX DOG**; **MANED WOLF**.

AGUAS BUENAS. An inland village in the east central part of the island of Porto Rico, 14 miles south of San Juan. There are three interesting caves within the confines of the village and excellent coffee and fruit farms in the environs. Pop., 1899, 1309; 1910, 1166.

AGUAS CALIENTES, ä'gwäs kä'lê-ën'täs. An inland State of Mexico bounded by the State of Zacatecas on all sides except the south and southeast, where it is touched by the State of Jalisco. It is one of the smallest States in the Republic (area, 2969 square miles), but its excellent climatic and rainfall conditions make it an important farming and grazing district. Gold, silver, iron, lead, and copper are mined. Pop., 1910, 120,511.

AGUAS CALIENTES (Sp. Hot Springs). The capital of the State of Aguas Calientes, 300 miles northwest of Mexico City (Map: Mexico, H 7). It is situated on a plateau 6000 feet above sea level and is the point of intersection of the roads from Mexico to Sonora and Durango and that from San Luis Potosí to Guadalajara. It is the distributing centre of the State, the principal local manufactures being tobacco and pottery. There are also tanneries, distilleries, and cotton mills, and the National Railway shops are located here. Copper, lead, and silver bullion, and hides are exported to the United States. It is the scene of a great fair, held at Christmas time each year, and lasting two weeks. The numerous hot springs of the surrounding district give the town its name. Pop., 1900, 35,052; 1910, 45,198.

A'GUE (Fr. *aigu*, from Lat. *acuta*, *febris*, acute, violent fever), *Febris intermittens*. The common name for intermittent, or malarial, fever. A paroxysm of ague is composed of three stages. In the first, a cold sensation creeps up the back and spreads over the body; the patient shivers, his teeth chatter, his knees knock together; his face, lips, ears, and nails turn blue; he has pains in his head, back, and loins. During this stage the temperature rises to 102° or even to 105° F. This condition is succeeded by flushes of heat, the coldness gives place to warmth, and the surface regains its natural appearance. The warmth continues to increase, the face becomes red and turgid, the head aches, the breathing is deep and oppressed, the pulse full and strong. The temperature ranges from 103° to 105° F. In the third stage the skin becomes soft and moist, the pulse becomes normal, a copious sweat breaks from the whole body, the temperature falls, and the patient generally sleeps.

These paroxysms occur at regular intervals. The interval between them is called "an intermission." When they occur every day, the patient has *quotidian* ague; every second day, *tertian*; and when they are absent for two days, *quartan*. There is a *double quotidian* form, in which there are two complete paroxysms in

every 24 hours. See **MALARIA AND MALARIAL FEVER**; **INTERMITTENT FEVER**.

AGUE-CHEEK, Sir ANDREW. A delightful old simpleton in Shakespeare's *Twelfth Night*, who fears that "beef hath done harm to his wit." He is, however, "old in nothing but understanding" and joins in the dance and song "Which is the Properest Day to Drink?" with the zest of a young man.

AGUESSEAU, ä'ge-sò', HENRI FRANÇOIS D' (1668-1751). A distinguished lawyer and chancellor of France, pronounced by Voltaire the most learned magistrate that France ever possessed. He was born at Limoges, in the department of Haute-Vienne. He received his earliest education from his father, and, devoting himself to the study of law, became *avocat-général* at Paris in 1690, and at the age of 32, *procureur-général* of the *Parlement*. While holding this office he effected many improvements in the laws and the administration of justice. A steady defender of the rights of the people and of the Gallican church, he successfully opposed the decrees of Louis XIV and the Chancellor Voisin in favor of the papal bull *Unigenitus* (q.v.). During the regency he became Chancellor, but after a year (1718) fell into disgrace through opposing Law's system of finance, and retired to his country seat at Fresnes. Returning to office in 1720 he endeavored to force the *Parlement* to register the bull, but nevertheless he was exiled a second time for his opposition to Cardinal Dubois. In 1727 he was recalled to the office of Chancellor, in which he remained till 1750. His works have been published in 13 volumes (Paris, 1759-89, 1819); *Lettres inédites* (Paris, 1823). Consult Monnier, *Le Chancelier d'Aguesseau* (Paris, 1864); Ingold, *Le Chancelier d'Aguesseau et l'Oratoire* (Paris, 1879).

AGUILAR, ä'gê-lär', GRACE (1816-47). An English writer of Jewish parentage. She was born at Hackney and first became known by two works on her own religion, *The Spirit of Judaism* (first published in America, 1842) and *The Jewish Faith* (1846), in the former of which she attacked the formalism and traditionalism of Judaism and insisted on its spiritual and moral aspects. She also wrote much fiction, more or less of a religious character, of which only the most popular story, *Home Influence* (1847, and about 30 subsequent editions), was published during her lifetime. The further titles include *A Mother's Recompense* (1850), *The Vale of Cedars* (1850), and *The Days of Bruce* (1852).

AGUILAR DE LA FRONTERA, ä'gê-lär' da la frön-tä'rá. A city of Andalusia, Spain, in the province of Cordova, occupying the summits and slopes of four low hills on the left bank of the Cabra, an affluent of the Genil, 26 miles south-southeast of Cordova (Map: Spain, C 4). The surrounding country is very fertile and abounds in vineyards and orange groves. All the houses of the Plaza Nueva, one of the principal squares of the city, are of three stories. Aguilar is remarkable for the whiteness of its buildings and the cleanliness of its streets. It has a fine parish church, a monastic church containing examples of many famous Spanish masters, and a dismantled castle, which was a stronghold on the Moorish frontier. The city has had an interesting history and at present belongs within the domains of the Duke of Medinaceli. The chief trade is in oil, wines,

grain, fruits and garden truck of all kinds. There are factories of brandies, liqueurs, chocolate, wax, chalk, soap, and plaster, and electrical plants. There are pasture lands and salt springs in the neighborhood. Pop., 1900, 13,311; 1910, 12,637.

AGUILAR Y CORREA, ANTONIO, Marqués de la Vega de Armijo (1824-1909). Spanish statesman and diplomat. Born in Madrid, he studied law in the universities of Seville and Madrid, and in 1855 became prominent in politics, associating himself with O'Donnell in the party called the *Unión liberal*. His first official position was that of Civil Governor of Madrid, which he used to make an active campaign against gambling and prostitution. This position he resigned in order to become successively Minister of Public Works and Minister of the Interior, in both of which positions he rendered important service. At the downfall of the *Unión liberal*, June 22, 1866, he worked for the success of the revolution, and when it had succeeded he helped in a monarchical manifestation. The Marqués was a member of the *Cortes constituyentes*, as representative of the province of Cordova. In 1873 he was sent as Ambassador of Spain to the French Republic, where he did important work in frustrating the plans of the Carlists on the frontier. After the restoration he recognized Alfonso XII, and took a seat in the Cortes, in the Centre group, which later affiliated with the Constitutionals. Under the latter he became Minister of State and accompanied Alfonso XII on his journey to foreign countries. In 1883 he passed to the opposition, and in 1884 was elected *Concejal* for Madrid. Upon the death of Alfonso XII his party returned to the government, and Vega de Armijo was elected Deputy for Madrid and for Lucena. In 1889 he was Deputy for Jetafe and became Minister of State for a year, when his party fell from power. Late in 1892, under the Presidency of Sagasta, he received for a third time the portfolio of the Department of State, which he resigned in April, 1893, in order to be elected, in May, 1893, President of the Congress, a post which he held until the fall of Sagasta in March, 1895. In July, 1898, he was elected President of the Congress of Deputies. Aguilar y Correa was a member of the Real Academia de Ciencias Morales y Políticas and the Real Academia de la Historia, and during the last years of his life, despite his great age, he was Director of both of them, while continuing his activities in politics.

AGUILAS, ä'gê-làs. A seaport town of southern Spain (Map: Spain, E 4). It is situated in the province of Murcia, 37 miles southwest of Cartagena, on the Aguilas-Lorca-Murcia Railway. It has a good harbor, and its port forms the chief outlet for the mineral and agricultural products of the surrounding country. It imports coal and contains several smelting works. Pop., 1900, 15,753; 1910, 15,967.

AGUILERA, ä'gê-lã'rã, VENTURA RUIZ (1820-81). A Spanish lyric poet, called "the Spanish Béranger." He was born at Salamanca and in 1843 went to Madrid to study poetry and political journalism. Here he occupied important official positions under the liberal ministries. The journals edited or controlled by him were characterized by bold ideas and keenness of criticism; and in these, as also in his *Satyras* and in the poems entitled *Ecos Nacionales*, he endeavors to arouse the masses to a sense of

their national dignity. His most important works are the collections of poems entitled *Elegias* (1862); *Armonías y cantares* (1865); *La Arcadia moderna*; and *Leyenda de nochebuena* (1872). Several collections of his prose writings, which consist mostly of short novels, have been published. An edition of his complete works appeared at Madrid in 1873, and selections from his poems were published under the respective titles, *Inspiraciones* (1866), and *Poesías* (1880).

AGUINALDO, ä'gê-näl'dô, EMILIO (1870-). The leader of Filipino insurrections against Spain and the United States. A Chinese mestizo of Chinese and Tagalog parentage, he was educated, first, in his native town and afterward at the College of San Juan de Letrán and the University of St. Thomas in Manila. At this institution, which is conducted by Dominican friars, he remained for four years. In course of time he became *gobernadorcillo*, or mayor of Cavité Viejo, and was acting as such upon the outbreak of the insurrection in August, 1896. Owing to his prominent participation in this uprising, he went to Hong Kong, consenting to a permanent exile from the islands on condition of a large payment on the part of Spain. In 1898 he returned to Manila, for the avowed purpose, it was said, of aiding the United States in the war against Spain, and immediately after the battle of Manila organized an insurrection, which soon assumed proportions unparalleled in the history of the archipelago. In this movement he displayed great ability and extraordinary personal magnetism. In 1899 he assumed the offensive against the United States, beginning operations by an attack upon Manila, February 4-5, in which he was unsuccessful. During 1899 there were a number of severe engagements. Finally, the native troops were so hard pressed by the Americans that Aguinaldo, after repeatedly removing his capital, was compelled to flee to the mountains. Here the fighting was continued with varying success until March 23, 1901, when Aguinaldo was captured by Brigadier-General Frederick Funston at Palawan, province of Isabella, Luzon, and brought to Manila. On April 19, 1901, he formally took the oath of allegiance to the United States, and retired from public life. Wildman, *Aguinaldo* (Boston, 1901); Philippine Information Society, *Publications and Facts about the Filipinos* (Boston, 1900-01); Turot, *Les Hommes de Révolution; Aguinaldo et les Philippines* (Paris, 1900).

AGUIRRE, ä-gê'rã, LOPE DE (c.1507-61). A Spanish explorer in Peru, known as the "traitor" and "tyrant." He was born in Oñate, in the province of Biscay, and came to America at an early age. He was in Peru during the period of the insurrections which followed the subjugation of the Incas and took an active part in most of them. The turbulent spirits who survived these repeated uprisings were finally influenced to join an expedition to search for El Dorado under Pedro de Urzúa. They crossed the Andes and started down the head waters of the Amazon in the early summer of 1560. Aguirre brought about the death of Urzúa and gained great influence over Fernando de Guzmán, Urzúa's successor. He then forced his companions to renounce their allegiance to Spain and to recognize Guzmán as King of Tierra Firme and Peru. He determined to abandon the search for El Dorado and return to Peru, con-

quer that country, and establish an independent kingdom there. Shortly afterward the newly made King opposed some of his plans, and Aguirre thereupon murdered him, together with his closest friends. Continuing down the Amazon, Aguirre made his way by one of that river's tributaries to the Orinoco, where he built large vessels, in which he sailed to the island of Margarita. He was forced, however, to abandon the plan of fighting his way across Panama and to Peru. Instead, he landed on the coast of Venezuela, marched inland, and was brought to bay and killed at Barquisimeto, early in November, 1561. His last act was to kill his own daughter with a poniard. In a letter addressed to King Philip II he declared that he had killed 20 persons during the voyage down the Amazon, and the recorded list of those he ordered murdered is more than 60, including women and priests.

Bibliography. Simon, *The Cruise of the Traitor Aguirre*, translated by Markham and Bollaert, chap. xi, Hakluyt Society Publication No. 28 (London, 1861). This account of the expedition was derived from members of the party. Consult also Bandelier, *The Gilded Man* (New York, 1893), and F. J. Vergara y Velasco, *Nueva Geografía de Colombia* (Bogotá, 1902).

AGUJA, ä-gōō'hā (from the Spanish *aguja*, a needle or bodkin). A large, voracious garfish (*Tylosurus fodiator*) of the coast of western Mexico, held in great dread by fishermen. The name (also spelled *agujon*) is extended to various related species of the West Indies and neighboring coasts. See NEEDLEFISH.

AGULHAS, ä-gōō'lyās, or ä-gūl'ās, CAPE. (Portug. needles.) The most southern point of Africa, about 100 miles east-southeast of the Cape of Good Hope, in lat. 34° 51' S., long. 19° 55' E., with a lighthouse erected in 1849 at an elevation of 52 feet (Map: Cape Colony, F 9). To the south of it lies the **Agulhas Bank**, which extends along the southern coast of the province of the Cape of Good Hope for a distance of over 400 miles from the Cape to Algoa Bay. To the south-southeast of Cape Agulhas it attains its maximum breadth, about 180 miles. It abounds in marine life, and its fisheries yield a sufficient supply for export.

AGULHAS CURRENT. A warm current forming the southern continuation of the Mozambique current, an offshot, between Madagascar and the coast of Africa, of the circulatory current system of the south Indian Ocean. As such it is considered to begin at 30° S. lat. off the coast of Natal; it flows southwestward along the coast of South Africa to Cape Agulhas (whence its name), where it is deflected to the southeast by the cold eastward-flowing West Wind Drift.

AGUSAN, ä-gōō'sän. Important river of the island of Mindanao, Philippines. It rises on the north slope of Tagnibay Mountain and flows almost due north. Throughout a total length of 156 miles it drains the valley of Surigao, which is 40 to 50 miles wide. In its flow to the sea it passes through a chain of lakes—Sadocun, Dagon, and Pinayat being the most important—and finally empties into Batuan Bay. The town of Batuan is at its mouth.

AGUSTIN, ä'gōōs-tēn'. See ITURBIDE, AGUSTIN DE.

AGUSTINA, ä'gōōs-tē'nā (?-1857). The "Maid of Saragossa." A *vivandière* in the Spanish army. She distinguished herself during the

siege of Saragossa (1808-09) by heroic participation in several severe encounters with the French. Once she snatched the fuse from a falling cannonier and fired the gun at the enemy, gaining by this act the name of "La Artillera." She was made sub-lieutenant in the Spanish army and presented with many decorations. Byron sings her praises in *Childe Harold* (Canto i, 54-56).

AGUTAINO, ä'gōō-ti'nō. A christianized Malay people living on Agutaya, one of the Cuyo Islands. See PHILIPPINES.

A'HAB (Heb. father's brother). King of Israel, c.872-851 B.C., the son and successor of Omri (q.v.). The story of his reign (1 Kings xvi. 29; xxii. 40) is told at greater length than that of any other monarch in Israel. In the opinion of many students it is derived from two different sources—one representing the prophetic attitude, the other a patriotic admiration of Ahab's courage and vigorous policy by which he succeeded in checking the advance of the Aramaic kingdom of Damascus and even the power of Assyria. Not only did Ahab hold Barhadad (q.v.) at bay, but he retained through half of his reign control over Moab, as the inscription of Mesha of Moab (see MOABITE STONE) testifies. These campaigns were waged against Damascus. In the first two Ahab was successful. In the interval between the second and the third, Ahab joined forces with Barhadad and a number of other Syrian kings to resist the attack of Shalmanezar III (860-825 B.C.). The latter, in his monolith inscription, mentions Ahab and estimates the contingent furnished by him at 2000 chariots and 10,000 soldiers, and the combined forces at 3940 chariots, 1900 horsemen, 62,900 infantry, and 1000 camels. The battle was fought at Karkar on the Orontes, and Shalmanezar III claims to have gained a victory. There is not a word, however, in any of his accounts, of plunder, of tribute, or of extension of Assyrian territory, so that some Assyriologists think that Shalmanezar actually suffered a defeat. Some time after this battle Ahab's relations with Barhadad became again hostile, and he finally combined with Jehoshaphat, King of Judah, in a movement to crush Damascus. But the allies were defeated, and Ahab himself fell in the battle of Ramoth Gilead (c.851 B.C.). He was married to Jezebel (q.v.), daughter of Ethbaal, King of Tyre (see Josephus, *Ant.* viii, 13, 1). Like Solomon, he built for his Queen a sanctuary to her god, Melkart, all the more readily as she had been a priestess herself in Sidon. That Ahab did not regard this act as hostile to Yahwe is shown by the fact that their children bear names in which Yah or Yaho appears as an element (Jehoram, Ahaziah, Athaliah). But in the eyes of a jealous Yahwe prophet like Elijah (q.v.) such conduct seemed reprehensible. The story of the struggle between the King and the prophet (1 Kings xvii-xix) is embellished with many incidents intended to bring out the superiority of Elijah and to present Ahab in an unfavorable light. While it would be unfair to regard him as a wicked king, it must be admitted that he was probably guided by political more than by religious considerations in his various acts. His generosity in dealing with Barhadad after the battle of Aphek (q.v.), so severely censured by a Yahwe prophet (1 Kings xx. 35), was no doubt due in part to his appreciation of the danger to both threatening from Assyria. Whether the severest charge brought

against him, his acquiescence in a judicial murder of Naboth (q.v.), is well founded, may be seriously questioned. There is much that seems highly improbable in the story, notably the part taken by Jezebel and the elders of Jezreel. Naboth having met with a violent death, and Ahab's desire for his vineyard being known, the King was naturally accused of the murder, and the responsibility was subsequently shifted to the foreign Queen. In course of the excavations undertaken by Harvard University at Samaria in 1908-09 the walls of the palace built by Omri and greatly enlarged by Ahab on the west and the south were unearthed. An alabaster vase was found bearing the name of Osorkon II, of Egypt (c.920-891 B.C.), which may have been brought to Samaria in the time of Omri or Ahab. Over 70 potsherds were also found inscribed with ink, dated in various years of the King's reign. They probably come from Ahab's time, but his name does not appear on any of them. Consult the histories of Israel by Stade (1887); Guthe (1899); Kittel (2d ed., 1909-12); Wellhausen (6th ed., 1907); Rogers, *Cuneiform Parallels to the Old Testament* (1912, pp. 288 ff.); Reisner in *Harvard Theological Review* (1900, pp. 248 ff.); Lyon, *ibid.* (1909, pp. 102 ff.; 1911, pp. 136 ff.); Vincent in *Revue Biblique* (1911, pp. 125 ff.); Abel, *ibid.* (1911, pp. 286 ff.).

AHANTA, à-hän'tá. A portion of the British colony of Gold Coast in West Africa, formerly belonging to the Dutch, who founded the settlement of Axim.

AHASUERUS, à-ház'û-ê'rûs. The name of Xerxes (485-465 B.C.) in the Book of Esther. It is the Latinized form of Heb. Achashwerosh, which occurs in Babylonian inscriptions as Akhshiwarsu, Akhshiyarsu, and Khishiarshu. In Dan. ix. 1, it appears as the name of the father of Darius the Mede, who received the kingdom after Belshazzar, the son of Nebuchadnezzar and Chaldean King, had been slain (v. 30; vi. 1). From contemporary inscriptions we know that Belshazzar was not the son of Nebuchadnezzar and not a Chaldean King, but the son of Nabunaid, the last King of Babylon, who was overthrown by Cyrus in 539 B.C. Darius the Mede has no place in history. In Tobit xiv. 15 Nineveh is said to have been destroyed by Nebuchadnezzar and Ahasuerus. Neither of those kings reigned when Nineveh was destroyed by Nabopolassar and Cyaxeres. See XERXES.

AHASUERUS. 1. The name of the *Wandering Jew* (q.v.), according to one legend. 2. The title of a drama by Edgar Quinet (published 1833) based on the same story.

A'HAZ (Heb. he supports). Son of Jotham, and twelfth King of Judah (c.735-715 B.C.). His rule was marked by disturbances, conflicts with surrounding nations, and innovations in religious rites. Early in his reign Pekah, King of Israel, and Rezin, King of Damascus, sought to place upon the throne of Judah Ben Tabel, probably a Damascene prince. They approached Jerusalem and probably laid siege to the city, but did not take it. On this occasion Ahaz was told by the prophet Isaiah not to fear these kingdoms, since the real danger threatened from Assyria (Isa. vii; 2 Kings xvi. 3). Incursions were made by the Edomites, to whom Ahaz was forced to give up the important city of Elath on the Gulf of Akabah (q.v.). Ahaz asked help of Tiglathpileser IV, King of Assyria (2 Kings xvi. 7; 2 Chron. xxviii. 16-22), who drove out the

invaders, but took heavy toll from Ahaz, compelling him to appear at Damascus as a vassal. While there, Ahaz saw an altar and ordered Uriaah, the high priest, to build one like it. On this Ahaz made sacrifices. He also made various changes in the temple service, sacrificed to Syrian deities, and caused his son to pass through the fire. Isaiah (chap. ii-v) furnishes a sad picture of conditions prevailing in Judæa in the days of Ahaz: frivolity, perversion of justice, avarice, oppression, besides infidelity toward Yahwe, being among the charges brought by the prophet against the King and his court. Yet, at the close of his reign, Isaiah contrasts the peace enjoyed by the poor of Yahwe's people with the heavy punishment meted out by Assyria on the Philistine cities. His name appears on the Assyrian monuments under the form Ya-u-ha-zi, from which the conclusion seems justified that the full name of the King was Jehoahaz ('Yahwe supports').

A'HAZI'AH (Heb. Yahwe supports). The name of two kings mentioned in the Bible. 1. The son and successor of Ahab, and eighth King of Israel (c.851-849 B.C.). On his accession the Moabites revolted, refusing to pay tribute, and before he could make preparations to go against them, he fell from a window of his palace. He sent messengers to the god Baal Zebub of Ekron to know the result of his injuries, but the messengers met Elijah, the prophet of Yahwe, on the way, who sent them back with word that the King would surely die (2 Kings i). Upon his death Joram, his brother, came to the throne. 2. Son of Jehoram and of Ahab's daughter, Athaliah (2 Kings viii. 25-27), the sixth King of Judah (c.844-843 B.C.). He is called Jehoahaz in 2 Chron. xxi. 17. Azariah, in 2 Chron. xxii. 6, is an error in transcription, as the Greek version shows, which has Ahaziah. He took part with his uncle, Jehoram, of Israel, in the latter's campaign against Hazael, King of Syria, in which the two kings were defeated (2 Kings viii. 28-29; 2 Chron. xxii. 5). Ahaziah was soon after slain by Jehu (842 B.C.) (2 Kings ix. 27; 2 Chron. xxii. 7-9), after a reign of only one year (2 Kings viii. 26; 2 Chron. xxii. 2).

AHEAD'. See BEARING.

AHENOBARBUS. See AENOBARBUS.

AHIMELECH, à-him'ê-lêk (Heb. brother of the king). A priest who, according to 1 Sam. xxii. 11, was the son of Ahitub. Some scholars are of the opinion that he is identical with Ahijah, who is also spoken of as a son of Ahitub (1 Sam. xiv. 3), as melek, 'king,' being a title of Yahwe, is used interchangeably with *Jah*. When David, warned by Jonathan, fled from Saul, Ahimelech, at Nob, fed him with the shewbread, gave him the sword of Goliath, and assisted him to escape (1 Sam. xxi. 1-10). For this offense Saul put Ahimelech and his whole priestly household to death, only one man, Abiathar, escaping (1 Sam. xxii. 11-20).

AHITH'OPHEL. A native of Giloh, in Judæa; Privy Counselor of David, and probably grandfather of Bathsheba (2 Sam. xi. 3; xxiii. 34). He was trusted implicitly by David, as well as by Absalom, whose revolt he joined (2 Sam. xvi. 23; xv. 12). It was by his advice that Absalom took possession of David's concubines and thereby laid claim to the throne. Hushai, "David's friend," also counseled Absalom, but with a view to helping David (2 Sam. xvi. 16; xvii. 16), and his counsel of delay prevailed over Ahithophel's plan of quick action (2

Sam. xvii. 1-14). Hereupon Ahithophel, in despair, went home, put his household in order, and hanged himself (2 Sam. xvii. 23). The meaning of his name is uncertain, and there is some doubt about the accuracy of its transmitted form.

AHLFELD, ä'fält, JOHANN FRIEDRICH (1810-84). A Lutheran pulpit orator. He was born at Mehlingen, Anhalt; studied at the University of Halle (1830-33); taught and preached in various places till in 1847 he became pastor in Halle, whence in 1851 he went to the Nicolai-kirche in Leipzig. There, till his resignation in 1881, he wielded a great spiritual influence as a leading evangelical. He died in Leipzig. He published several volumes of sermons. Consult his *Life* (Halle, 1885).

AHLGREN, äl'grën, ERNST, pen name of VICTORIA MARIA BENEDICTSSON, née BRUZELIUS (1850-88). A Swedish author. She was born at Domme, near Trelleborg (Scania) and in 1871 married Christian Benedictsson, postmaster of Hörby. In consequence of illness and of great worry, she committed suicide at Copenhagen, whither she had gone in 1888. Her collection of novels, entitled *Från Skåne* (1884), and the satirical narrative *Penningar* ('Money,' 1885; 2d ed., 1889) soon made her name known favorably throughout Sweden, where she was afterward regarded as the most distinguished among the younger woman writers. Her works are characterized by marked simplicity of style and a powerful and artistic description of life. Among them may be mentioned *Fru Marianne* (1887; 2d ed., 1890); *Folklif och Små Berättelser* (1888); *Berättelser och Utkast* (1888); *Romcos Julia*, a drama (1888); *Final*, a drama (in collaboration with A. Lundgård, 1885). Consult Ellen Key, *Ernst Ahlgren, Några Biografiska Middelanden Stockholm* (1889).

AHLQUIST, äl'kvist, AUGUST ENGELBERT (1826-89). A Finnish philologist and poet, professor of Finnish literature at Helsingfors, where he had studied philosophy and philology. He was distinguished for ethnographic investigations, especially of the dialects and races of the Ural-Altai family. In 1847 he started a Finnish journal (*Suometar*). He translated some of Schiller's works into Finnish and wrote poems. He traveled extensively through northern Russia and western Siberia to study the customs and languages of their inhabitants. The results of these observations he embodied in his most important original works: *Wotish Grammar* (1855); *An Attempt at a Moksha-Mordwinian Grammar* (1861); *The Structure of the Finnish Language* (1875).

AHLWARDT, äl'värt, HERMANN (1846-1914). A German politician and anti-Semitic agitator. He was born at Krien, Prussia, and about 1890 joined the anti-Semitic movement. He published a number of writings under the titles of *Der Verzweiflungskampf der Arischen Völker mit den Juden* (1890); *Eid eines Juden* (1891); *Jüdische Taktik* (1892); and *Judenflinten* (1892), in which last-mentioned pamphlet he declared that Ludwig Löwe & Co. had furnished worthless guns to the army and had been hired by the *Alliance Israélite* to cheat the German government. These charges were declared by Chancellor von Caprivi to be false, but the popularity of the agitation steadily increased; and Ahlwardt was elected deputy to the Reichstag in 1892 and reelected in 1893. He visited the United States in 1895, for the purpose of es-

tablishing an anti-Semitic propaganda here, but failed of his object.

AHLWARDT, WILHELM (1828-1909). A German orientalist. He studied Oriental languages at Greifswald, his native city, and at Göttingen, and afterward devoted himself to an analytical investigation of the Arabic manuscripts in the libraries at Gotha and Paris. He became second librarian and professor of Oriental languages at the University of Greifswald in 1861. The following are a few of his more important works on Arabic philology and literature: *Ueber Poesie und Poetik der Araber* (1856); *The Divans of the Six Ancient Arabic Poets* (1870). He also edited the following works by Arabic authors: *Elfachri Geschichte der islamischen Reiche . . . von Ibn Ettigthaga* (1860); *Chalef Elahmar's Kaside* (1859); *Diwan des Abu Nowas* (1861); and *Sammungen alter arabischer Dichter* (3 vols., 1902-03). He catalogued the Arabic MSS. in the Berlin Royal Library (in general catalogue, 10 vols., 1887-1900).

AHMADABAD, ä'mä-dä-bäd' (for derivation, see ABAD). The chief town in the district of the same name, in the presidency of Bombay, India, situated on the left bank of the Sabar-mutti, 309 miles by rail north of Bombay, in lat. 23° N., long. 72° 36' E. (Map: India, B 4). It was founded in the year 1412, on the site of the ancient Ashawal, by Ahmed or Ahmad Shah, and in 1818 came under British rule. It was famous for its manufacture of rich fabrics of silk and cotton, articles of gold, silver, steel, and enamel, industries still carried on, and to which may be added the manufacture of paper shoes and superior pottery. It has recovered much of its extensive trade in indigo, cotton, and opium. It was formerly one of the largest and most magnificent capitals in the East, the centre of Oriental art, and its architectural relics are splendid, even in the midst of decay. The Jumna or Juma'ah Masjid, or great mosque, rises from the centre of the city, and is adorned by two superbly decorated minarets. Its domes are supported by lofty columns, regularly disposed, and the concave of these cupolas is ornamented with mosaic and fretwork. The pavement is of the finest marble. The mosque of Sujaat Khan and the modern Jain temple of Seth Hathi Sinh are extremely beautiful. There is likewise an ivory mosque, so named from the circumstance that, although built of white marble, it is lined with ivory, and inlaid with a profusion of gems, to imitate natural flowers, bordered by a silver foliage on mother-of-pearl. There are also the Fire Temple and the Tower of Silence of the Parsis. Ahmadabad once abounded in gardens, and there were aqueducts, reservoirs, etc. The city walls, built in the fifteenth century, which had become very dilapidated, were repaired in 1834, and a system of water works was installed. There are a number of educational institutions located here, the most important being Rat Guza College. Pop., 1891, 148,400; 1901, 185,889; 1911, 216,777.

AHMADABAD. A district of Bombay (q.v.), British India (Map: India, B 4). Area, 3824 square miles. Pop., 1911, 827,809.

AH'MED, PRINCE. In the *Arabian Nights*, a favorite of the good fairy Pari-banou, by whom he was given a tent which could shelter a whole army and yet could be folded up and put in one's pocket. The same fairy gave him also the apple of Samarcand, which was a cure for all diseases.

AHMED äh'mëd, or **ACHMET**, äk'mët, **VEFIK PASHA** (1818-91). A Turkish statesman, born in Constantinople and educated in Paris. His historical and statistical researches appeared in *Salaamé*, an annual of the Ottoman Empire begun in 1847. He was intrusted by the Porte with many important missions abroad and was President of the Council and Minister of the Interior at the conclusion of the Treaty of San Stefano (1878). He did much to acquaint his countrymen with French literature by his admirable translations of the plays of Molière and others. He also translated parts of Schiller and Shakespeare into Turkish.

AHMED IBN HANBAL. See **IBN HANBAL**.

AHMED KHAN, kân or kân. See **MONGOL DYNASTIES**.

AHMED MIRZA (1898—). A Shah of Persia, who succeeded his father Mohammed Ali (q.v.) on the latter's deposition from the throne on July 16, 1909. He was the second son of Mohammed, and seventh in the Kadjar line of ruling princes. Although not the eldest son, he was nominated heir-apparent by his father because the mother of his elder brother was not of the Kadjar, or royal line. On account of his youth when he ascended the throne, as well as by reason of the troubled condition of affairs in Persia (q.v.), he did not rise to be much more than a figure-head in the government.

AHMEDNAGAR, ä'mëd-nüg'ür, or **AHMED-NUGGUR** (Skr. *nagara*, city). A large town in the presidency of Bombay, India, situated 64 miles northeast of Poona, in lat. 19° 6' N., long. 74° 46' E., on a branch of the Great Indian Peninsular Railway (Map: India, B 5). It was founded by Ahmad Nizam Shah late in the fifteenth century and became a splendid and populous city. Although it was devastated by incessant wars, relics of its former magnificence are to be seen in many fine specimens of Moslem architecture. It was noted for the weaving of carpets, but the manufacture of silks, cottons, brass, and copper utensils has to a great extent superseded this industry. The city is surrounded by an earthen wall, and is guarded by a fort half a mile to the east. The houses are mostly built of sun-dried brick. It has a good water supply, conveyed by means of aqueducts. The city was taken by the British under General Wellesley in 1803 and came under British rule in 1817, since when it has regained much of its former prosperity. Several places in India bear the same name. Pop., in 1901, 42,032; in 1911, 42,940.

AHMEDNAGAR. A district of Bombay (q.v.), British India (Map: India, B 5). Area, 6613 square miles. Pop., 1911, 945,305.

AHMED SHAH, äh'mëd shä (1724-73). Ameer of Afghanistan from 1747 to 1773. He was hereditary chief of the Abdali tribe and held a command in Nadir Shah's cavalry until the latter's assassination (1747), when Ahmed went to Afghanistan, changed the name of his tribe to Durrani, and was accepted as their ruler by the Afghan chiefs at Kandahar. He was a warlike ruler and accumulated great wealth, including the famous Kohinoor diamond. He captured Lahore in 1748 and conquered Kashmir, and in 1756 defeated the Great Mogul and took and sacked Delhi. His conquests introduced rebellion and disorder into the Mogul Empire. He defeated the Sikhs and Mahrattas at Panipat, Jan. 6, 1761, but was finally obliged to yield the Punjab.

AHMED TEWFIK, PASHA (1843—). A Turkish diplomat. He served in the army and then entered the diplomatic service, becoming Minister at Athens in 1882, Ambassador at Berlin in 1884, and Minister of Foreign Affairs from 1895 to 1899. Under the new régime he was again Minister of Foreign Affairs from July, 1908, to February, 1909, and Grand Vizier for a short time in the latter year.

AHMES, ä'mës, or **AAHMESU**, ä'me-söö. An Egyptian scribe, who lived before 1700 B.C. He wrote *Directions for Obtaining the Knowledge of all Dark Things*. This work was not original with him. It was copied from an older treatise, dating from about 2500 B.C. It is important as one of the earliest satisfactory accounts of ancient Egyptian mathematics. It has been translated by Eisenlohr, *Ein mathematisches Handbuch der alten Aegypter* (Leipzig, 1877). See **ALGEBRA**; **ARITHMETIC**.

AHN, än, **JOHANN FRANZ** (1796-1865). A German grammarian and educationist. He was born at Aix-la-Chapelle, was for a time a merchant, but studied mathematics and modern languages, and was for many years a teacher in Neuss. He wrote many manuals for teaching languages, his method of instruction being an extension of that of Seidenstücker. His *Practical Method for a Rapid and Easy Acquisition of the French Language* (*Praktischer Lehrgang zur Schnellen und Leichten Erlernung der französischen Sprache*, 1834) has passed through more than 200 editions and been extensively imitated.

AHNFELDT, än'fëlt, **ARVID WOLFGANG NATHANAEL** (1845-90). A Swedish littérateur, born at Lund. He studied art at Lund and Upsala and was for some time an official in the royal library at Stockholm. In 1881 he was appointed editor of the journal *Ur Dagens Krönika* and was also associate editor of the liberal *Aftonblad*. He published a number of important monographs, such as those on *Almqvist* (1876) and *Crusenstolpe* (1880), a *Verldslitteraturens Historia* (1875-76), and other works.

AHOY' (a + hoy). A nautical form of hail. Its original signification is said to have been "stop," and it still partakes of that meaning in a modified sense. It is used as a hail to passing boats, vessels, and implies that communication with them is desired. The common form of usage is "boat ahoy," "ship ahoy," "steamer ahoy," etc.

AHRENS, CARL (1866—). A Canadian landscape painter. He was born in Winfield, Ontario. He studied art in New York City under William Chase, Edward Elwell, and George Inness and soon won emphatic recognition at various art exhibitions in Canada, some of his pictures being bought by the Ontario government. He was associated with Elbert Hubbard for three years in the Roycroft community at East Aurora, N. Y., after which he went to southern California. His pictures of the ruins of the old Spanish missions there attracted attention. He returned to Canada in 1907. His paintings are distinguished for their atmospheric effects. Among the best known are "Cradled in the Net" (exhibited at Chicago World's Fair), "The House in the Clearing," "Passing Showers," "The Woodcutters," "The Glow in the Woodland," and "The Coming Storm."

AHRENS, ä'rens, **HEINRICH** (1808-74). A German writer on law, philosophy, and psychology. He studied at Göttingen and was concerned

in the political troubles in 1831, by reason of which he was forced to flee to Paris. In 1834 he became professor of philosophy at Brussels. He was a member of the Frankfort Parliament of 1848, and on the committee to draft a new German constitution. In 1850 he was chosen professor of legal and political science at Gratz, and in 1859 was called to a similar chair at Leipzig. For a number of years he represented the Leipzig University in the First Saxon Chamber. Among his works are: *Cours de psychologie* (1837-38); *Cours de droit naturel* (1838); *Die juristische Encyklopädie* (1855-57). The two last-named works have been republished in several languages.

AHRENS, HEINRICH LUDOLF (1809-81). A celebrated German philologist, born at Helmstedt. He studied at Göttingen, where he began his career as *privat-docent* in 1829, but left Göttingen in the following year to accept a position at Ilfeld, where he remained for 14 years. In 1849-79 he was director of the lyceum at Hanover. He devoted himself especially to the Greek dialects, and may be said to have laid the foundation of their scientific study. His chief publication was *De Græcæ Linguae Dialectis* (Göttingen, 1839-43). He published also, in 1855-59, a two-volume edition of the Greek bucolic poets, Theocritus, Bion, and Moschus.

AHRIMAN, ä'rī-mān. The ancient Persian devil, a personification of the evil spirit and principle of evil, the idea which answers in the Zoroastrian religion to Satan in Judaism and Christianity. He is represented as the head and chief of the powers of darkness and sin, and he has legions of demons about him. Next to him are ranged six arch-fiends, the chief of whom is Aēshma, the Daēva, or 'demon of fury,' corresponding, according to the majority of scholars, to the name Asmodeus (q.v.). Ahriman's name appears in the Avesta as *angra mainyu*, or *aisra mainyu*, Persian, *ahriman*—whence our spelling of the word. The term *mainyu* means 'spirit,' and *angra*, 'oppressing'; the title *angra aisra* is uncertain, but it is presumed to signify 'injury, opposition, antagonism.' Ahriman is the spirit of opposition, antithesis, and antagonism to the Persian god Ormuzd (q.v.). The two spirits severally represent the kingdom of light, goodness, and life, and the kingdom of darkness, evil, and death. The relation of the one spirit to the other, especially of Angra Mainyu, as the maleficent spirit, to Sponta Mainyu, or the beneficent spirit, has been frequently discussed. Consult Darmesteter, *Ormuzd et Ahriman* (Paris, 1877), and Jackson, "Die iranische Religion" in Geiger and Kuhn's *Grundriss der iranischen Philologie*, vol. ii (Strassburg, 1896-1904).

AHU, ä'hōō. The name in Persia of the common Asiatic gazelle. See GAZELLE.

AHUATLE, ä'ōō-ät'l (Mexican). A preparation for food of the eggs of a Mexican species of ephydrid fly, which is formed into a paste mixed with hens' eggs and then fried. For further information, see EPHYDRA; FLY.

AHULL' (*a + hull*). A maritime term, used to denote the position of a ship when all her sails are furled and her helm lashed on the lee side; in such a position she lies nearly with her side to the wind, but with the head turned a little toward the direction of the wind, and is said to *lie ahull*.

AHUMADA, ä'ōō-mä'dä, DON PEDRO GIRÓN, MARQUÉS DE LAS AMARILLAS, DUKE OF (1788-1842). A Spanish general and statesman, born

at San Sebastian. He was appointed an officer in the Royal Guards in 1806, and during the war against the French rendered important services as chief of the general staff of the Spanish army. Upon the outbreak of the revolution of 1820 he was appointed Minister of War, but soon retired because of the opposition of the Radicals. He was appointed by Ferdinand VII a member of the Council of Regency during the minority of Isabella, and in 1835 accepted the Portfolio of War under the premiership of Torreno. He soon resigned, and went to Bordeaux in 1836, but subsequently returned to Madrid.

AHURA MAZDA, ä-hōō'rä mäs'dä. See ORMAZD.

AHWAZ, ä-wäz'. A small village, once a residence of the Persian rulers, situated on the river Karun, about 45 miles south of Shuster (Map: Persia, C 5). Near Ahwaz are the ruins of the old town, lying along the river for a distance of over 10 miles. There are still to be seen ruins of an old castle of gigantic proportions, and some other evidences of former splendor. In the third century Ahwaz was the chief city of a province of the same name, and under the subsequent rule of the Arabs it became an important commercial centre, reaching the height of its prosperity in the twelfth and thirteenth centuries. A concession to navigate the Karun from the Persian Gulf to Ahwaz was granted to a British company which runs a steamer on the river, and which has made extensive highway improvements between this town and Ispahan. Pop., about 1600.

AI, ä'i (Heb. *hāai*, the stone heap). A city of the Canaanites, 12 miles north of Jerusalem. It is mentioned in the narrative about Abraham (Gen. xii. 8), where its situation is defined as east of Bethel. When the Israelites came into Canaan, they made an unsuccessful attack on Ai (Josh. vii. 5), but on the second attack the city was taken (Josh. viii) and destroyed. (See ACHAN.) Isaiah (Isa. x. 28) mentions the city under the name of Ayyath, so that it must have been rebuilt. After the captivity it was inhabited by the Benjaminites (Ezra ii. 28; Neh. vii. 32). The modern site is Khirbet Haiyân, also called Khirbet 'el Kudêrah. Ruins of Ai existed in the time of Eusebius and Saint Jerome. The pools, cisterns, tombs, and other ancient remains at Khirbet el Kudêrah have been especially described by Guérin, *Description de la Judée* (Paris, 1869, iii, pp. 57 ff.); Conder, *Palestine Exploration Fund Memoirs* (ii, 372; iii, 20 ff.), and Sellin, *Mitteilungen und Nachrichten des Palästina Vereins* (1899-1900).

AI, ä'i. The onomatopoeic name of the three-toed sloth. See SLOTH.

AI, ä'è, or AHYU, ä'û. A Japanese salmon (*Salmo altivelis*), remarkable for going down some rivers to spawn in the sea, and ascending other rivers annually to spawn near their sources.

AICARD, ä'kär', JEAN FRANÇOIS VICTOR (1848—). A French author born at Toulon. He made his first appearance in literature with the drama *Jeunes croyances* (1267). His works, which are in general distinguished by a finished style, include *Au clair de la lune* (1870), a one-act comedy in verse; *Les rébellions et les apaisements* (1871); *Poèmes de Provence* (1874) and *La chanson de l'enfant* (1876), both of which were crowned by the Academy; *Miette et Noré* (1880); *Lamartine* (1883); *Jésus* (1896, 1912), a lyrical epic; *Tata* (1901, 1910); *L'âme d'un*

enfant (1903), idealistic tales; the plays: *Légende du cœur* (1903); *Benjamine* (1906); *L'illustre Maurin* (1908); *Maurin des Maures* (1908). His most popular play is *Le Père Lebonnard* (1890). In 1913 he published *Hollande; Algérie*. He became an Academician in 1909.

AID (Fr. *aide*, from Lat. *ad*, to + *iuvare*, to help). In feudal times, a term denoting a payment in money made to the suzerain on certain occasions. The term is a translation of the Latin word *auxilium*. In theory it was a free grant made in exceptional cases. But the cases soon came to be fixed by custom. In England "the three chief aids" were paid (1) for the lord's ransom when in captivity; (2) for the expenses of making the lord's eldest son a knight; (3) for the dowry of the lord's eldest daughter. These were levied upon all classes of freehold tenants in England—upon those holding in free and common socage (q.v.), as well as upon the holders of knights' fees (q.v.)—and continued to be nominally due and exigible until abolished by Parliament, 12 Car. II, c. 24 (1660), though they had gradually fallen into disuse and were probably even then practically obsolete. In France a fourth chief aid was demanded for the expenses of the suzerain when he went on a crusade. The obligatory aids varied, however, by custom from province to province on the Continent and might be demanded for various unusual expenses to which the lord might be put. See FEUDALISM; TENURE.

AIDA, ä-ē'dä. An opera by Verdi (words by Ghislanzoni), first played at Cairo, Egypt, Dec. 24, 1871, at the inauguration of the Khedive's new theatre. The scene of it is laid in ancient Egypt.

AIDAN, ā'dan, SAINT (?-651). First bishop of Lindisfarne. He was one of those distinguished monks of the early Scotch-Irish church who were received into the calendar of saints without the ceremony of canonization. In early life he was a monk in Iona, the famous island off the Scotch coast. Oswald, the celebrated King of Northumbria, requested the community of Iona to send to his court one of their brethren who would teach the Christian religion to his people. The first person sent was a certain Cormac, who was too dogmatic and intolerant to be a successful missionary. On his return to report to the synod his failure, Aidan, who possessed the patience, geniality, and popular manners fitted for the task, was consecrated bishop (635) and sent forth. Through his success, he left a great reputation as the earliest promulgator of Christianity in the northern districts. He died at Bamborough, Aug. 31, 651. The day of his feast is August 31. For his biography, consult Fryer, *Aidan, the Apostle of the North* (London, 1884).

AID-DE-CAMP, ād'dè-kāmp' (Fr. camp assistant), or **AID**. A military officer serving on the staff of a commanding general officer. In time of war it is a position of grave responsibility, as shown by the terrible mistake which led to the brilliant but foolish light cavalry charge of the British in the Crimean War of 1854. It is also a position involving much danger, as may be seen from the nature of the duties performed. On active service the aid-de-camp is in close confidential touch with the general officer to whom he is attached, and when necessary acts as his military secretary. On the battle-field he carries all orders from the general in command to the commanding officers of

the various arms, and must of necessity be alert, quick-witted, resourceful, and prompt, giving his message in the plainest and most unmistakable form. Wherever possible, such orders must be delivered in writing. In European nations an appointment of aid-de-camp, particularly if on the staff of the ruler or a member of the ruling family, carries much social as well as military prestige, while in all services it is a much coveted and much sought appointment. In the United States a lieutenant-general is allowed to have two aids (lieutenant-colonels) and a military secretary; a major-general, three aids (either captains or lieutenants); and a brigadier-general, two aids (lieutenants). Before an officer below the rank of major can receive such appointment, he must have served at least two of the six preceding years with his troop, battery, or company. The appointment is for four years and may not be exceeded.

AIDĚ, ä'è'dä', CHARLES HAMILTON (1830-1906). An English poet and novelist. He was born in Paris, the son of a Greek diplomatist. His mother was a daughter of Admiral Sir George Collier. He was educated at Bonn, served seven years in the British army, retired in 1853 with the rank of Captain, and then devoted himself to literature. Among his poems are *Eleanore* (1856) and *Songs without Music* (1882). His novels include *Rita* (1856); *Confidences* (1859); *Passages in the Life of a Lady* (1887); *Elizabeth's Pretenders* (1895), besides about 15 others. As a ballad writer he is known by *The Danube River* and *Remember or Forget*. A volume of his collected poems was published in 1903, and after his death appeared his last novel, *The Chivalry of Harold* (1907). Aidě was remarkable for his versatility; he wrote plays as well as novels and verse, and was an amateur artist.

AIDENN, ā'den. A collateral form of Eden, Paradise, from the Arabic *Adn*, used by Poe in *The Raven*, on account of the rhyme.

AIDE-TOI ET LE CIEL T' AIDERA, ād twä' ā le syël tã d'rã' (Fr. Help thyself, and Heaven will help thee). The cry of certain French political writers to the middle classes about the year 1824. It became the watchword and title of a society having for its object to agitate the electoral body in opposition to the government. This, however, was to be done by means strictly legitimate, chiefly by correspondence and political publications. Most of its founders and active members belonged to the party of *Doctrinaires* (q.v.), as Guizot, who was president for some time, Duchâtel, Duvergier de Hauranne, Dubois, Rémusat, Thiers, Cavaignac, etc. *Le Globe* was the organ of the association, and afterward *Le National*. The society had a great share in bringing about the revolution of July, 1830, and was at first countenanced by the new government; but after a short time it was dissolved (1832).

AIDIN, î-dēn', or GUZEL-HISSAR. An important town in the Turkish vilayet of Smyrna (21,583 square miles; pop. (est.), 2,500,000), in Anatolia. It is on the river Meander, about 56 miles southeast of Smyrna, with which it is connected by rail (Map: Turkey in Asia, B 4). It is picturesquely situated near the ruins of ancient Tralles, and has well-shaded streets, fine bazaars, Greek religious edifices, and a number of Turkish mosques. It has an extensive trade in figs and cotton, and manufactures leather and sweetmeats. In 1899 the town suffered severely

from an earthquake. Its population is about 36,000.

AID'-MA'JOR. An adjutant in the French army. See **ADJUTANT**.

AIGNER, à'nyà', JOSEPH MATTHÄUS (1818-86). An Austrian portrait painter. He was born at Vienna, and during the revolution of 1848 he was Commandant of the students' legion in Vienna, for which he was condemned to death when the city was taken by the imperial troops. Pardoned at the intercession of his friends, he renewed his art studies under Rahl. Until his surprising death by suicide in 1886, he was one of the most popular portrait painters of Austria. Most interesting of his portraits are those of the poet Lenau and the Russian General von Danielos, painted in the madhouse in which they were confined. Other good examples are those of the Emperor Franz Joseph, Empress Elizabeth, the poet Grillparzer, the Wertner family group of nine, and his own portrait. His work is characterized by broad technique and warm color.

AIGRETTE, ā'grèt or â-grèt', French for a small white heron or egret. (See **EGRET**.) Hence, a plume or erect ornament of feathers, originally the long filiform tuft of feathers that spring from the back of the egret in the breeding season, and arranged to adorn the hair, a bonnet, headdress, or helmet, or something similar to this, especially when jeweled. "A small bundle of these feathers has been used among Eastern nations as an ornament, and worn in the front of the turban, caftan, or other headdress by personages of high rank, being occasionally mounted with, or its form imitated by, precious stones; and the gift of an egret so bejeweled has been one of the most distinguished marks of honor that could be bestowed by an Oriental ruler upon a favorite minister or successful leader." The fashion has spread to western nations and given rise to various decorations on military hats and for women's hair and bonnets. The demand of millinery, indeed, during the last quarter of the nineteenth century caused such inroads upon the breeding colonies of white herons in all parts of the world that these birds are everywhere greatly diminished in numbers, and in some regions, as in Florida, are almost exterminated. As the desired plumes grow only during the breeding season, the killing of a bird for their sake usually means the death of a family and the rapid depopulation of the colony. From this point of view, and remembering that great cruelty is likely to accompany the obtaining of the plumes, the statement of the annual sales of aigrettes in London and other great markets is appalling to all persons of a humane mind and delicate taste.

The reduction in the number of birds throughout the world, together with considerable protective legislation in various countries, has greatly reduced the amount of aigrettes annually auctioned at the feather sales and has increased the value of these plumes until a single ounce has brought 225 shillings (\$54) in the London market.

AIGUEBELLE, ěg'běl', PAUL ALEXANDRE NEVEUE D' (1831-75). A French naval officer who entered the Chinese army. He distinguished himself against the Tai-Pings in 1862-64, commanded the Franco-Chinese corps, and captured Hang-Chow-Foo, for which service he was made a mandarin of the first class. He established the arsenal at Fu-Chow-Foo and taught the

Chinese to construct European vessels, the first Chinese man-of-war being launched under his supervision in 1869. In that year he was made grand admiral of the Chinese fleet.

AIGUES-MORTES, ěg'môrt' (anciently Lat. *Aquæ Mortuæ*, Dead Springs). A small town in France (pop., 1906, 3899; 1911, 3900), in the department of Gard, 21 miles southwest of Nîmes (Map: France, S., J 5). It is situated in an extensive marshy region impregnated with sea salt, and is about 3 miles from the Mediterranean, with which it is connected by a canal. There are extensive vineyards in the vicinity, all of which can be watered by means of fire pumps. The town claims to have been founded by Marius, but it is altogether likely that it owes its origin to St. Louis, who sailed from here on his crusades in 1248 and 1270. Philip the Bold, his son, in 1272 began to surround the town with fortifications which are now among the chief points of interest in France, surpassing even those of Carcassonne and Avignon.

AIGUILLE, â-gwêl' (Fr. a needle). The name given to certain sharp mountain peaks in the Alps often covered with ice and snow and so called from their resemblance to needles. Around Chamounix a number of the peaks bear this name. The term is applied also to an instrument used by engineers to pierce a rock for the injection of gunpowder in blasting.

AIGUILLETES, ā'gwil-lêts' (from Fr. *aiguillette*, a point, pointed tag; dimin. of *aiguille*, needle). A detachable portion of the military dress uniform consisting of bullion, silk, woolen or cotton cords and loops, and worn on the shoulder. In the United States army aiguillettes are worn by officers of the General Staff Corps, by officers of the Adjutant-General's department, the Inspector-General's department, the officers of the Bureau of Insular Affairs, the aids-de-camp to general officers, and regimental, and artillery district adjutants, adjutants of engineer battalions, military attachés, adjutant of United States Army, and aids to the President of the United States. By the Chief of Staff and the aids to the President aiguillettes are worn on the right shoulder, by all others on the left shoulder. For commissioned officers aiguillettes are made of gold-wire cord, according to a sealed pattern kept in the office of the Quartermaster-General.

Aiguillettes are worn by naval officers who are acting as personal aids to the President and the Secretary of the Navy, aids at the White House, members of the personal staff of a flag officer, aids to commandants of navy yards or naval stations, aid to the Superintendent of the Naval Academy, and naval attachés. They are worn on the right side by the aid to the President and the aids at the White House; on the left side by all others.

AIGUILLON, â'gwê'yôn', ARMAND DE VIGNEROT DUPLESSIS RICHELIEU, DUC D' (1720-82). A French statesman, Minister of Foreign Affairs under Louis XV (1771-74). He became Governor of Brittany in 1754. Together with Mauplou and Terray, he formed part of the famous and scandalous *Triumvirat*; his despotic administration of his province finally brought upon him the condemnation of the Parliament of Rennes. But Madame du Barry, the mistress of Louis XV, not only saved him from punishment, but finally brought about his promotion as Minister. He was entirely incompetent, and Louis XVI replaced him by Vergennes.

AIJALON, ā'já-lōn. See AJALON.

AIKAWA, i-ká'wá. A town of Japan, on the western coast of the island of Sado (Map: Japan, F 4). It is poorly built, and its importance has greatly diminished because of the lessened production of gold and silver mines situated close to it. The Governor of the island resides in Aikawa. Pop., 1912, about 13,000.

AIKEN, a'ken. A city and the county-seat of Aiken Co., S. C., on the Southern Railway, 17 miles east of Augusta (Map: South Carolina, C 3). It is situated in an agricultural and pine forest region, the dryness and comparative mildness of its climate combining to make Aiken a health as well as a popular pleasure resort. Aiken is the seat of Aiken Institute; St. Angela's Academy, for white students; the Schofield Normal and Industrial School; and the Robertson Training School, for negroes. It was first incorporated in 1835 and is governed under a charter of 1890, revised in 1897, which provides for a mayor, elected biennially, and a city council, composed of a mayor and six aldermen. The water works and sewage system are owned by the municipality. Pop., 1890, 2362; 1900, 3414; 1910, 3911.

AIKEN, WILLIAM (1806-87). An American legislator. He was born in Charleston, S. C., and graduated at the College of South Carolina (1825). After serving in the State Legislature (1838-43), he was Governor of South Carolina (1844-46), and was a Democratic Representative in Congress from 1851 to 1857, during which time he lacked only one vote of becoming Speaker of the House of Representatives. He opposed both nullification and secession and after leaving Congress took no active part in politics, except in 1866, when he was again elected to Congress, but was not admitted to a seat. The town and county of Aiken, S. C., were named after him.

AIKIN, JOHN, M.D. (1747-1822). An English physician and author. He had only moderate success as a physician, but gained considerable reputation as a scholarly writer. With his sister, Mrs. Barbauld, he published *Evenings at Home* (6 vols., 1792-95), together with a number of biographical works, including *General Biography* (10 vols., 1799-1815). He edited the *Monthly Magazine* (1796-1807) and *Dodsley's Annual Register* (1811-15). He wrote also *Essays on Song Writing* (1810); *Vocal Poetry* (1810); and *Memoirs of Oliver Goldsmith*. Consult *Memoirs of John Aikin, M.D.* (Philadelphia, 1824), by his daughter, Lucy Aikin.

AIKIN, LUCY (1781-1864). An English writer, daughter of John Aikin, and his assistant in much of his work. She wrote one novel, *Lorimer* (1814), but her reputation rests on her series of court memoirs, beginning with *Memoirs of the Court of Elizabeth* (1818), and on her *Life of Addison* (1843). She also wrote memoirs of her father and of her aunt, Mrs. Barbauld.

AILANTHUS, ā-lān'thūs, or **AILANTUS**, ā-lān'tūs (Latin form of Amboyna, *ailanto*, 'tree of heaven'). A lofty, spreading tree (*Ailanthus glandulosa*), of the family Simaroubaceæ, a native of China, but now frequently planted to shade public walks in the South of Europe, in England, and in North America. The flowers of the male plant have a disgusting odor. The leaves resemble those of the ash. The tree flourishes on light soils and is hardy enough to endure even the climate of the North of Scotland. It has been somewhat extensively

planted in the United States. The tree is easily propagated by suckers and cuttings of the roots. The wood is fine-grained, satiny, and suitable for cabinet making. *Ailanthus imberbiflora* and *Ailanthus punctata* are among the important timber trees of Australia. Another species, *Ailanthus excelsa*, is common in India. The genus *Ailanthus* has been recognized by fossil fruits and leaves in Tertiary beds of Europe and North America.

AILANTHUS MOTH. A large, hardy, silk-spinning moth (*Philosamia cynthia*), introduced from China into the United States on the ailanthus tree. The caterpillar may be identified by its rows of tufts of white hairs. The moth which has become common near several of our cities has a spread of wings of 5 inches, and is of a general olive-brown ground color, with a whitish lunate discal spot and a white and purplish transverse bar on each wing.

AILETTE, ā-lēt' (Fr. little wing). An appendage to the armor worn by knights on each shoulder. At first they were plates of iron especially to protect the shoulders. Later they were not intended primarily for defense, as is evident from the fact that most of them stood up straight in the air. They came to be made in various forms and frequently bore the heraldic device of the knight. Epaulets are sometimes said to have been derived from these.

AILLY, ā'yē', PIERRE D', or PETRUS DE ALLIACO (1350-1420). A French theologian. He studied theology in Paris, where, in 1380, he became a doctor of the Sorbonne. He was leader of the Nominalists, asserted that the Church rests on Christ, not on Peter, and derives its authoritative teachings from the Scriptures, not from canon law. He became grand master of the College of Navarre, Paris, in 1384, and in 1389 confessor and almoner to Charles VI, and the same year Chancellor of the University of Paris. His defense, two years previous, of the Immaculate Conception won him the epithets "Eagle of France" and "Hammer of Heretics." He became Bishop of Le Puy, 1395, and of Cambrai in 1397. He induced the calling of the Council of Pisa, of which he was an active member. He was made Cardinal by John XXIII (1411), and was sent as Legate to Germany in 1413. He was prominent in the Council of Constance, 1414-18, furthering the condemnation of Huss and Jerome of Prague, but strenuously advocating reform in the Church; maintaining the authority of councils over that of popes, and aiding in the election of Martin V in place of three rival popes. He was afterward made Papal Legate at Avignon until his death. His writings are numerous. Among them is an attempt to harmonize astronomy and theology. For his biography, consult P. Tschackert (Gotha, 1877) and L. Salembier (Lille, 1886).

AILSACRAIG, āl'sá krāg. A small island off the west coast of Ayrshire, Scotland (Map: Scotland, C 4). It is only 2 miles in circumference and rises to a height of 1114 feet above the sea. It terminates in high cliffs on the northwest and contains some springs near its summit. It is well known for its columnar form and has a lighthouse, erected in 1836.

AIMAK, i-māk'. A term of Mongolian origin signifying 'clans,' or 'tribe,' and, with the prefix *char* ('four'), employed as a designation for a number of tribes inhabiting the central and north-western part of Afghanistan. Little is known concerning them except that they are a Mongo-

lian people dwelling in the midst of an Aryan population, and speaking a language that seems closely related to the Kalmuck, though largely influenced by the Persian. According to some authorities the four principal tribes of the Aimak are the Jamshidi, the Firozkohi, the Taimani, and the Hazaras; others make a definite distinction between the Aimak and the Hazaras, characterizing the former as Sunnite Mohammedans and the latter as adherents in the main of the Shiite sect. Macgregor, *Central Asia* (Calcutta, 1871), substitutes the Saidnat for the Hazaras and estimates the total number of the Aimak at 250,000, describing them as semi-nomadic in their habits and excellent fighters. They are supposed to be descendants of Turkish-Tatar tribes which under Hulaku Khan overthrew the Persian Caliphate in the middle of the thirteenth century.

AIMARA, ī-mä'rá. Any of many large carnivorous fishes of South America, especially common in the Amazonian rivers, some 20 species of which form the heterognathous family Erythrinidæ and the genus Macrodon. They are also called trahiras.

AIMARD, á'mär', GUSTAVE (1818-83). A French novelist. He shipped to America as a cabin-boy, spent 10 years among the Indians of the western prairies, and traveled in Spain, Turkey, and the Caucasus. In 1848 he was in Paris and an officer of the Garde Mobile. At the time of the Franco-German War he organized, and for a while commanded, the so-called "francs-tireurs of the press." He is sometimes called "the French Fenimore Cooper." He published many adventure stories, for the most part improbable but interesting. The list, many volumes of which have been translated into English, includes *Les trappeurs de l'Arkansas* (1858), *Le grand chef des Ancas* (1858), *Les pirates de la prairie* (1859), *La forêt vierge* (1870), and *Les scalpeurs blancs* (1873).

AIME-MARTIN, á'má'mär'tän', LOUIS. See MARTIN, LOUIS AIMÉ.

AIMOIN, á'mwän' (c.960-c.1010). A French chronicler, born at Villefranche de Longchapt. He became a monk in the monastery at Fleury. His works include *Historia Francorum* (edited by G. Waitz and published in *Monumenta Germaniæ Historica: Scriptores*, vol. xxvi), his best-known work; *Vita Abbonis, Abbatís Floriacensis*; and *Miracula Sancti Benedicti* (books ii and iii). The two latter works were published by J. Mabillon in *Acta Sanctorum Ordinis Sancti Benedicti* (1668-1701).

AI'MON. See AYMÓN.

AIM'WELL. 1. A character in Farquhar's (q.v.) comedy, *The Beaux' Stratagem*. 2. A character in Shirley's *The Witty Fair One* (q.v.).

AIN, ān. A river in eastern France, which rises in the Jura Mountains. It flows south-southwest through the departments of Jura and Ain, and after a course of about 120 miles falls into the Rhone, 18 miles above Lyons (Map: France, S., K 2). It is used for floating timber and admits of navigation down stream only.

AIN. A frontier department of France, separated from Switzerland and Savoy by the Rhone (Map: France, S., K 2). Crêt-de-la-Neige (5635 feet) and Mont Reculet (5627 feet), the highest peaks of the Jura Mountains, are in the eastern part. In the south and west there are extensive marshes. The soil produces bituminous limestone, from which Seyssel asphalt is made. At one time there were as many as 2000 artificial lakes in this region, where fish breeding

was carried on, but many of these have been drained and the basins turned into farm land. Capital, Bourg. Area, about 2250 square miles. Pop., 1911, 342,482.

AINGER, ān'jēr, ALFRED (1837-1904). An English clergyman and writer. He was born in London and was educated at King's College and at Trinity Hall, Cambridge. He was ordained priest in 1863 and three years afterward was appointed reader of the Temple Church, a position which he held until 1894, when he succeeded Dean Vaughan as Master of the Temple. He became a canon of Bristol and chaplain-in-ordinary to Queen Victoria in 1896 and to King Edward in 1901. As an author, he is best known for his editions of *Lamb's Collected Works* his *Biography of Charles Lamb* (*English Men of Letters* series, 1882); his *Life and Works of Charles Lamb* (12 vols., 1899-1900); and *Crabbe* (1903). Following his death, H. C. Beeching edited a volume of his sermons under the title *Gospel of Human Life* (1904) and his *Lectures and Essays* (2 vols., 1905). Consult Edith Sichel, *Life and Letters of Canon Ainger* (1906).

AINMILLER, in'mil-ēr, MAX EMANUEL (1807-70). A German designer of stained glasses, the principal reviver of this art in the nineteenth century. He was born at Munich, Feb. 14, 1807, and at first studied architecture and decoration in the Munich Academy under Gartner and was then appointed designer in the Royal Manufactory of Porcelain at Nymphenburg. When the Royal Manufactory of Stained Glasses was organized at Munich, he was made inspector of the institution and afterwards became its head. By his technical improvements he revived the ancient art of stained glasses, achieving a variety of color not hitherto attained. He was also the first to design stained glasses on panels, thereby founding an interesting variety of this art. He usually contributed the general design and the decorative features, leaving the figures to important contemporary artists. His principal works include the windows of the cathedrals of Regensburg, Cologne, and Speyer, and of the Aukirche in Munich; also the University Church at Cambridge, St. Paul's Cathedral, London, and the Cathedral of Glasgow—the last being the most extensive of his works. Though excellent for their time, these works are hard and cold in color compared to the best productions of the present day. In many of his works he was assisted by his son Heinrich (1837-92), who was also an artist of note. The elder Ainmiller also painted interiors of mediæval churches, showing minute architectural knowledge, but poor color.

AINO, ī'nō, or **AINU**, ī'nōō (men of Aiona, their reputed ancestor, or possibly a corruption of *inu*, dog, contemptuously applied to them by the Japanese). An aboriginal people, now numbering some 18,000 souls, in northern and eastern Yezo, the southern part of Saghalien, and the southern Kuriles (all but 1500 live on Yezo). They inhabited once a great part, if not all, of the Japanese Archipelago and were the first race to dwell there, unless the so-called "pit-dwellers" of Yezo and Saghalien were, as Hitchcock (1890) suggested, driven out by them when they intruded into this area from their former home on the adjoining Asiatic coast many centuries B.C., as the archæological remains (shell heaps, stone implements, pottery, etc.) in Japan indicate. The retreat northward of the Aino is noted in Japanese chronicles referring to the

“barbarians.” The physical characteristics of the Aino—short stature, flattened humerus and tibia, heavy beards, and general hirsuteness (much exaggerated by travelers), lighter skin, dolichocephaly and brachycephaly, somewhat regular features, and non-savage looks—have given rise to theories of relationship with almost every known race. Brinton (1890) allies them with the Giliaks of the Amur; Deniker (1900) considers them *sui generis*; Keane (1896) and Baelz (1901) believe them to have been originally of the Caucasian (white) race. The last, who has studied the Aino at first hand, is of the opinion that they are the extreme eastern branch of a race related to the Caucasian stock, once occupying much of northeastern Asia, but split into two sections by the inroads of the Mongol-Turkish peoples at a very remote date, a view which has a good deal to commend it. But the Aino are not a uniformly pure type, as the differences between those of Yezo and of Saghalien show. The linguistic, geographical, and mythological researches of B. H. Chamberlain (1887) and Batchelor (1882-94) prove both the uniqueness of the Aino tongue and the great influence upon Japanese life exerted by that people in times past. Driven northward from their ancient habitat in southwestern and central Japan, they have left their names on the natural features of the archipelago. Their language is simple and harmonious and resembles the Japanese in structure, but is quite distinct in vocabulary. It has been reduced to writing only recently. The Rev. John Batchelor has compiled an Aino grammar and dictionary and translated the New Testament into the tongue. The Aino religion, originally a rather primitive nature-worship, with the cult of the bear especially prominent, and their folk-tales, have evidently received some additions from Japanese sources in historical times. In the last few years some of the Tsuishikari Aino have become Buddhists of the Monto sect, and a few others in the region of Piratori have become Protestants. A good account of the Aino (with bibliography) was published by Professor Hitchcock in the *Report of the United States National Museum* for 1890. An important discussion of them is to be found in the anthropological studies of Koganei (1893-94), and Landor's *Alone with the Hairy Ainu* (1893). Baelz, in the *Verhandlungen der Berliner Gesellschaft für Anthropologie* for 1901, considers that the amount of Aino blood in the Japanese outside of Yezo has been much underestimated. He notes also the increasing intermixture of Japanese and Aino and foresees the ultimate disappearance of the latter, not by extinction, but by natural amalgamation with the former. This amalgamation is favored by the gradual abandonment of ideas about their alleged mental inferiority. (See JAPAN, paragraph *Ethnology*.) In addition to the works cited in the text, consult: Griffis, *The Mikado's Empire* (New York, 1876); Siebold, *Ethnologische Studien über die Aino* (Berlin, 1881); Bird, *Unbeaten Tracks in Japan* (London, 1885); Chamberlain and Batchelor, *Aino Studies* (Tokio, 1887); MacRitchie, *The Ainos* (London, 1892); *Transactions of the Asiatic Society of Japan* (Yokohama, 1874-98); Batchelor, *The Ainu and their Folk-lore* (London, 1901); Chamberlain, in *Journal of Race Development* for 1912-13.

AINSLIE, ānz'li, HEW (1792-1878). A Scottish-American poet, born at Bargeny Mains, Ayrshire. While a clerk in the register house at

Edinburgh, he acted as amanuensis to Prof. Dugald Stewart. He emigrated to the United States in 1822, and joined for a year Robert Owen's venture at New Harmony, Ind. (See HARMONISTS.) He subsequently went into business. His numerous dialect poems had extended his reputation to Scotland, where he was enthusiastically received by literary folk in 1864. These poems, many of which were highly esteemed by Sir Walter Scott, were collected and edited by a friend, W. Wilson (1855). Some of them are also to be found in Wilson's *Poets and Poetry of Scotland* (1876). Consult T. C. Latto, *Memoir of Hew Ainslie* (1892).

AINSWORTH, ānz'wūth, FREDERICK CRAYTON (1852—). An American soldier, born at Woodstock, Vt. He was appointed assistant surgeon, United States army, in 1874, and in 1891 major and surgeon. In 1899 he was promoted to be colonel and Chief of the Record and Pension Offices, and in that capacity introduced the index record-card system, by means of which the history of every soldier is made readily available. By his systematic management he saved annually half a million dollars in clerk hire. He was made a major-general and military secretary in 1904, and three years later his rank was changed to that of adjutant-general of the United States army. He was the first man to hold that important office who had not previously served in command of troops. His arbitrary rulings in refusing the use of war records to historical scholars led to his retirement in 1912.

AINSWORTH, HENRY (1571-1623). An English scholar and divine. He was driven from England by proscription in 1593 because he was a Brownist, and lived in poverty in Amsterdam until, in 1596, he became teacher in the church there of the Brownists. Though never forward, he was the most steadfast, resolute, and cultured champion of the principles of civil and religious freedom represented by the nonconformists in Great Britain and America. While fighting for freedom from hierarchical tyranny, Ainsworth pursued his Hebrew studies, and for a long time biographers had two Henry Ainsworths—one the learned rabbinical student, the other the arch-heretic and leader of the Separatists; but the two were one man. His most notable work is *A Defense of the Holy Scriptures, Worship, and Ministry used in the Christian Churches separated from Anti-Christ, against the Challenges, Cavils, and Contradictions of M. Smythe in his Book entitled "The Differences of the Churches of the Separation"* (Amsterdam, 1609). He wrote notes on all the books of the Pentateuch, the Psalms, and Solomon's Song. There is a story, not probable, that he was poisoned by Jews. See W. E. A. Axon, *H. Ainsworth, the Puritan Commentator* (Manchester, 1889); J. H. Shakespeare, *Baptist and Congregational Pioneers* (Philadelphia, 1907).

AINSWORTH, ROBERT (1660-1743). An English lexicographer, author of a Latin dictionary which was once extensively used. He was born near Manchester and taught school in London. He began his dictionary in 1714; it was first published in 1736 under the title *Thesaurus Linguae Latinae Compendiarius*. In it he still rejects the "English" pronunciation.

AINSWORTH, WILLIAM FRANCIS (1807-96). An English physician, geologist, and traveler. He was born in Exeter and graduated in medicine at Edinburgh in 1827. He

then traveled in France and prosecuted geological investigations in the Auvergne and Pyrenean mountains. On his return in 1828 he conducted the *Journal of Natural and Geographical Science* and delivered lectures on geology. In 1835 he was attached as physician and geologist to the Euphrates expedition under Colonel Chesney, and returned home in 1837 through Kurdistan, the Taurus, and Asia Minor, visiting the latter again the following year. He published *Researches in Assyria* (1838). He also published *The Claims of the Christian Aborigines in the East* (1843); *Travels in the Track of the Ten Thousand Greeks* (2 vols., 1844); *The River Karun an Opening to British Commerce* (1889).

AINSWORTH, WILLIAM HARRISON (1805-82). An English novelist, born at Manchester. His creative fancy began early to show itself in ballads and tales, which appeared in the local newspapers and in contributions to the *London Magazine* and other periodicals. He first studied law; but, tiring of that, he began a publishing business in London, which did not succeed. His first novel was *Sir John Chiverton* (1826); his second, *Rookwood* (1834), was very favorably received. *Crichton* (1837) and *Jack Sheppard* (1839) followed soon after. He edited *Bentley's Miscellany* for a time; in 1842 began his own *Ainsworth's Magazine*, and from 1853 edited the *New Monthly Magazine*. Some of his other works are: *The Tower of London* (1840); *Guy Fawkes* (1841); *Lancashire Witches* (1848); *Star Chamber* (1854); *Cardinal Pole* (1863); *John Law, the Projector* (1864); *The Spanish Match* (1865); *Merrie England* (1874); and *Beau Nash* (1880). He wrote 41 volumes in all. All his works, and particularly his earlier ones, were remarkably popular in England. Their publication began when the inane "fashionable novel" was the staple, and they presented an agreeable contrast. The historical element, together with the scenery of his native country, is prominent in most of them. Analysis of character or motives has no place in his works; his strength is in the vividness and directness with which he realizes scenes and incidents, and he is to be reckoned among the so-called picaresque writers, from his admiration of bandits, highwaymen, and thieves, as in *Rookwood*, where Dick Turpin is the hero. Consult Laman Blanchard, *Memoir of William Harrison Ainsworth*.

AINTAB, in-täb'. A town in the Syrian vilayet of Aleppo, Asiatic Turkey, situated about 65 miles north of the city of Aleppo on the southern slope of Mount Taurus (Map: Turkey in Asia, G 4). It is an important military post and is well fortified. It carries on an extensive trade in leather and cotton, and lies on the route leading from Aleppo to Armenia. Much wine is also produced. The city was burned down late in the nineteenth century, but has since been rebuilt. Its population is about 43,000, and consists, to a great extent, of Armenian and Greek Christians.

AI'NU. See **AINO**.

AIR, ä-ēr', or **ASBEN**. A mountainous region in the southern part of Sahara, situated between 17° and 20° N. lat. and 7° and 10° E. long. It is the most important centre of population in the desert. The palm, fig, and mimosa yield abundant fruit; the camel and zebra are raised on the pastures. The mountains are of granite and basalt, and some of the peaks are nearly a mile high. There are no permanent rivers, but the numerous ravines fill with water during

the rainy season and overflow the valleys. The great caravan which makes its annual passage between Belma and Hansa stops at the numerous watering-places in this region. The country is ruled by a native sultan, and the population, estimated at about 100,000, consists chiefly of Tuaregs. The capital is Agades (q.v.), but Tintellust (60,000 inhabitants) is the chief centre of population.

AIR (Lat. *aër*, Gk. *ἀήρ*, *aēr*, from *ἄειν*, *aein*, to blow). The mixture of gases forming the atmosphere of the earth. It consists essentially of 79.03 parts of nitrogen and 20.97 parts of oxygen, with varying small quantities of carbonic acid, ammonia, ozone, argon, helium, neon, krypton, xenon (qq.v.), and aqueous vapor. Certain chemical compounds, as common salt, ammonium nitrate, etc., as well as minute particles of animal, vegetable, and mineral matter, are also frequently found in the air. Early chemists called all gases airs. The chief properties of air and the phenomena they give rise to may be found treated under **ATMOSPHERE**; **AËRODYNAMICS**; **AËROSTATICS**; **AËRONAUTICS**; **BAROMETER**, ETC.

AIR IN MUSIC. A succession of single tones arranged in rhythmical groupings, so that they are readily apprehended by the ear as melody. The term is also used to denote the principal phrase or melody (generally the highest voice) as distinguished from the accompanying voices. In such expressions as "national air," "operatic air," it denotes the entire composition. Composers of all nationalities have shown a decided fondness for employing the French word in such titles as *air de ballet*, *de violon*; *air triste*, *mélancolique*, etc., for compositions in which decidedly melodious phrases are written for a solo voice or instrument, to which the other instruments furnish a mere accompaniment of sustaining chords or figuration. During the sixteenth and seventeenth centuries the term was used in England in a restricted sense to denote a lively, cheerful strain. As a technical term synonymous with "aria" (q.v.) the word is becoming more and more rare.

AIR BLAD'DER OF FISH'ES. See **FISH**.

AIR BRAKE. A brake worked by compressed air, which is extensively applied to railway cars in the United States and also to a less extent in other countries. Air brakes are also used on street railway cars. The air brake in its first form was invented by George Westinghouse, Jr., an American engineer, in 1869 and is known as the straight air brake. This brake consisted of an air pump, a main reservoir, and an engineer's valve on the locomotive, and of a train pipe and brake cylinder on each car. The air pump served to keep the main reservoir filled with air under pressure, and the brakes were applied by throwing the engineer's valve so as to allow the air from the main reservoir to enter the train pipe and thence into the brake cylinders on the cars, thus forcing the pistons out and applying the brakes on each car. The train pipe of one car was connected to that of the next by flexible hose, with a coupling between cars. This form of brake had several objections, the more important of which were that the brakes on the forward cars were applied so much sooner than those on the rear cars that the rear cars bunted up against the forward cars, causing shocks and damage; and in case a hose burst or a coupling parted, the air pressure would escape without setting the brakes. These objections to the straight air brake led Mr. Westing-

house to invent, in 1872, the automatic air brake. In this brake each car was equipped with an auxiliary reservoir and a triple valve in addition to the train pipe and brake cylinder. The triple valve was located at the junction of the train pipe and the two pipes leading to the brake cylinder and to the auxiliary reservoir. The principle of operation of this improved brake is as follows: Air pressure is maintained in the auxiliary reservoirs and in the train pipe at all times when the brakes are not applied, the pressure in the train pipe being exactly equal to that in the reservoirs, and there being no pressure in the brake cylinder, owing to the fact that as long as the train pipe and auxiliary reservoir pressures are equal, the triple valve is held in a position closing the air inlet to the brake cylinder. To apply the brakes, the equilibrium between the train pipe and the auxiliary reservoir pressures is disturbed by allowing air to escape from the train pipe; as soon as this is done, the excess air pressure in the auxiliary reservoir throws the triple valve so that it admits pressure from the reservoir into the brake cylinder and applies the brakes. To release the brakes, air pressure is retained in the train pipes by admitting air to it from the main reservoir on the locomotive. This gives an excess pressure in the train pipe above the pressure in the auxiliary reservoir, which throws the triple valve so as to close the inlet to the brake cylinder and open the inlet to the auxiliary reservoir from the train pipe, thus allowing the two to attain equal pressures again. To permit air to escape from the train pipe and thus apply the brakes, there is the engineer's valve previously mentioned, and also a conductor's valve on each car, the latter being used only in case of emergency. It is evident also that should a break occur in the train pipe, or its hose connections, through any accident, the pressure is relieved and the brakes are applied automatically.

It will readily be appreciated from what has been said that the triple valve is an exceedingly important part of the mechanism of the automatic air brake. It performs three duties: (1) Charges the auxiliary reservoirs; (2) applies the brakes; and (3) releases the brakes. These duties are, moreover, performed automatically, and, as experience has shown, with almost absolute certainty as long as the valve mechanism is kept in good order. The triple valve is, however, not the only automatic feature of the air brake. The operation of the air pump is controlled automatically by a pump governor, which shuts the steam off from the air pump as soon as the pressure in the main reservoir has reached a certain amount, and admits it again when the pressure falls below this amount. There is also an automatic contrivance for closing the ends of the coupling hose when they are disconnected; this valve opens automatically when the hose is coupled.

The plain automatic air brake was obviously a vast improvement over the straight air brake. Its chief objection was that in an emergency application on a long train the forward brakes were applied so much sooner than those in the rear that the slack of the train ran ahead and often did great damage. To remedy this objection Mr. Westinghouse invented, in 1887, the quick action triple valve, by which the application was so much hastened at the rear of the train that the slack had no chance to run ahead. The quick action automatic air brake is a plain automatic brake in which the great improvement is from

an emergency or safety standpoint, and the present quick action automatic brake is equipped with the quick action triple valve. This valve is identical with the plain triple valve as far as service operations are concerned, but differs from it in emergency, in that it automatically vents air from the brake pipe locally on each car. The rapid brake pipe reduction thus resulting is transmitted to the next triple valve, and from it serially in the same manner to all the valves in the train, thereby reducing the time of full emergency application to about one-sixth of what is possible with the plain triple valves on a 50-car train. This also permits of a higher braking power for emergency than for service applications.

The very high passenger train speeds of recent years led Mr. Westinghouse, in 1897, to place on the market a high speed brake. This brake is designed to use very high air pressure when the brake is applied with the train at full speed, which pressure is gradually reduced by an automatic reducing valve on the brake cylinder as the speed diminishes.

The standard form of brake equipment for American railroad trains is the quick action automatic brake for freight cars, the P. C. passenger brake equipment for passenger cars, and the E. T. locomotive brake for both freight and passenger locomotives. Every type of brake equipment on a locomotive, of course, can be used for any type of air brake equipment on cars in a train. The distinctive departure from the quick action type of brake in the P. C. type is a modification of the triple valve known as a control valve. This control valve consists of four elements: the equalizing portion, which is the portion directly affected by variations in brake pipe pressure and controls, either directly or indirectly, the desired charging of the reservoirs, the application of the brake, whether in service or emergency, and the release of the brake; the application portion, which controls the flow of air only from service reservoir to service brake cylinder and the release of the same and has nothing to do with the emergency reservoir or the emergency brake cylinder; the emergency portion, which contains a double piston and slide valve which controls the flow of air from the emergency reservoir to the emergency cylinder and the release of the same to the atmosphere; and the quick action portion, which corresponds in general to the quick action portion of a triple valve and operates only when an emergency application of the brakes is made, vents brake pipe air to the atmosphere locally on each car, and closes the vent to the atmosphere automatically after the desired brake pipe reduction has been made.

The E. T. locomotive equipment consists of an air compressor, the main reservoir, a duplex compressor governor (to control compressor when the pressures for which it is regulated are obtained), a distributing valve, two brake valves (the automatic to operate locomotive and train brakes, and the independent to operate locomotive brakes only), a feed valve (to reduce the brake pipe pressure), a reducing valve and gauges, brake cylinders, dirt collectors, hose coupling and fitting, etc. The differences between the E. T. and the quick action are in general that, instead of a triple valve and auxiliary reservoir for each of the engine and tender equipments of the quick action, the E. T. has the distributing valve which is made to supply all brake cylinders. The distributing valve consists

of two portions, the equalizing portion and the application portion, and is connected to a double chamber reservoir. The equalizing portion and the pressure chamber of the double chamber reservoir are used in automatic applications only. Reductions of brake pipe pressure cause the equalizing valve to connect the pressure chamber to the application chamber and cylinder, allowing air to flow from the former to the latter. The principle embodied in the quick action triple valve, by which it gives a high braking power in emergency applications and a sufficiently lower one in full service applications to provide a protection against wheel sliding, is accomplished by cutting off the application chamber from the application cylinder in all emergency applications, which gives a smaller volume that has to be filled from the pressure chamber and a correspondingly high brake cylinder pressure.

With the introduction of electric locomotives it was necessary at first only to have a motor-driven air compressor instead of the steam compressor in use on steam locomotives. An important development, however, of the air brake, tried out on the Pennsylvania Railroad for application to steam trains, was an adaptation of the air brake equipment used on the Hudson & Manhattan electrically operated trains, known as the electro-pneumatic system. This system consists of a combination of the latest form of pneumatic service and emergency apparatus, with electric control for either operation. While the electric control is used normally, the pneumatic is held in reserve without its efficiency being impaired. Two brake cylinders, a supplementary reservoir, a control valve and the engineer's brake valve, in addition to the usual cut-out cocks, complete the brake equipment. A single control valve performs automatically all the functions of the triple valve, and in addition provides for maintaining the pressure in both brake cylinders constant against leakage. For further and more technical information on this subject, see Blackall, *Air Brake Catechism* (New York, 1911); Synnestvedt, *Air Brake Diseases* (New York, 1900); Dukessmith, *Modern Air Brake Practice* (Chicago, 1904); instruction pamphlets published by the Westinghouse Air Brake Company, Pittsburgh, Pa; also *Proceedings Master Car Builders' Association*.

AIR CELLS, or AIR SACS. See BIRD.

AIR COMPRES'SOR, or AIR PUMP. A machine for compressing air. This may be made more definite by defining compression to be the act of making a greater weight of air occupy the same volume as before; or making the same weight of air occupy a less volume. This must be accompanied in either case by an increase in its elastic tension or pressure. When released from the containing reservoir or vessel, the air tends to resume its volume at the pressure and temperature of atmospheric air.

Compressed air is used for a multitude of purposes in the arts and in manufacturing, and to catalogue all of its uses would require a great amount of space. The simplest form of air pump is the little apparatus for inflating bicycle tires, with which nearly every one is familiar. These bicycle pumps are made both single and double acting, the single-acting pump being the simplest form of air compressor. Compared with the enormous air-compressing machines used in shops and mines, this little device seems almost too trivial to merit notice, but by carefully observing its actions and their effects there are brought

to our attention several phenomena which are important facts in air compressing on a large scale. One of these phenomena is the power required to pump against the elastic resistance or tension of the compressed air in the nearly inflated tire; the second and more important is the fact that a very perceptible development of heat results as the pumping proceeds. The bearing of both these observations will appear in further treatment. For the present it need only be observed that hand air pumps of the simple form indicated are used for a variety of purposes where only a small amount of compressed air is required. Where a somewhat larger volume of air is required, hand pumps provided with fly-wheels and operated by one or more men by means of cranks, are employed. From these large hand pumps the progress to power air compressors is of degree, not of kind.

The air pump was invented by Otto von Guericke of Magdeburg, Germany, about 1654. In 1753 Holl used an air engine for raising water by air pressure on its surface, and in 1788 Smeaton invented a pump for use with diving apparatus. In 1851 compressed air was used by William Cubitt for bridge work, and a little later it was used by Brunel for the same purpose. In 1852 Colladon patented the application of compressed air for driving machine drills in tunnel construction. Sommeiller developed Colladon's idea, and constructed an air-compressing plant for the Mont Cenis Tunnel work. The Sommeiller compressor was operated as a ram, utilizing a natural head of water to force air at 80 pounds pressure into a receiver. The column of water contained in a long pipe on the side of the hill was started and stopped automatically by valves controlled by engines. The weight and momentum of the water forced a volume of air with such a shock against a discharge valve that it was opened, and the air was discharged into the tank. The valve was then closed and the water checked, and a portion of it was allowed to discharge and the space to fill with air, which was in turn forced into the tank. The injection of water in the form of a spray into the compressor cylinder was first introduced on the St. Gothard Tunnel work begun in 1872. The first compressor used in America was developed by Thomas Doane, the chief engineer of the Hoosac Tunnel, and was employed on that work. This compressor had four single acting cylinders and was cooled by the injection of water through the inlet valves into the cylinders. These early compressors are of historical interest only at the present time. As the necessity for compressed air power grew, inventors turned their attention to the design and construction of compressors which would combine efficiency with light weight and economy of space and cost. As the result of this work, the modern air compressor has been developed.

The simplest form of power air compressor is the air brake pump, with which practically every American locomotive is equipped. In this pump, it will be readily understood, the main considerations are economy of space, light weight, and absolute reliability of action; economy of steam consumption being quite a secondary matter. A 9½-inch air brake pump, for example, will give 1.85 cubic feet of air at 90 pounds pressure, with a consumption of 1 pound of steam at 140 pounds pressure, while a two-stage Corliss air compressor will give 13.7 cubic feet of air at 90 pounds pressure with the same steam consumption. The

AIR BRAKE

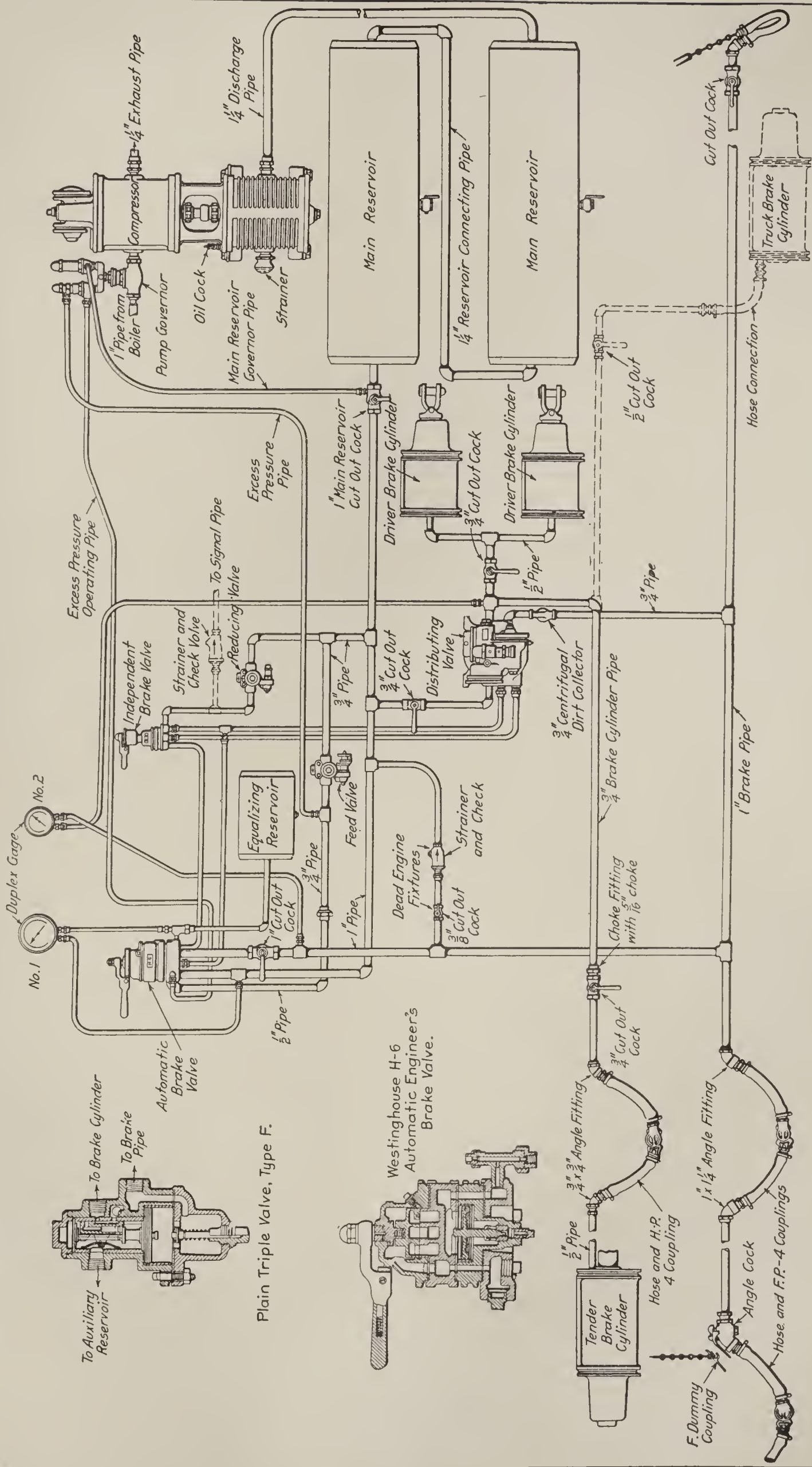
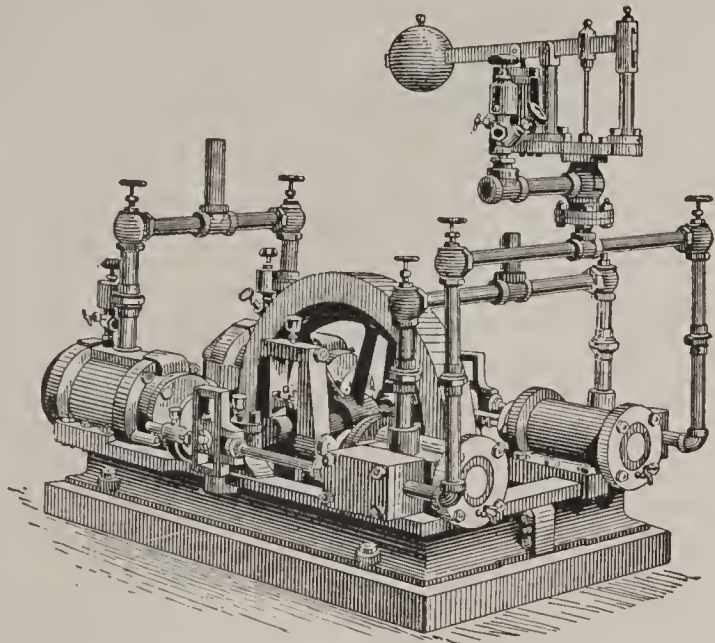
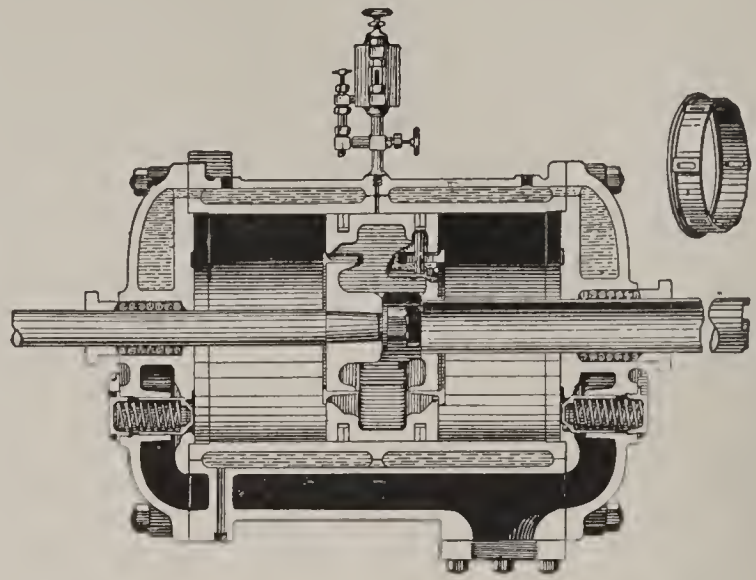


DIAGRAM SHOWING ARRANGEMENT OF WESTINGHOUSE E. T. (ENGINE AND TENDER) AIR BRAKE EQUIPMENT

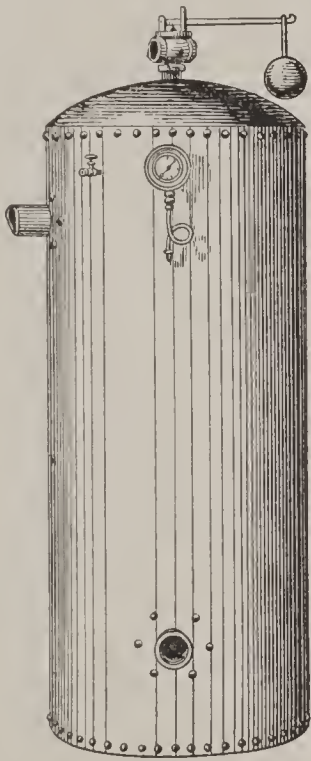
AIR COMPRESSORS



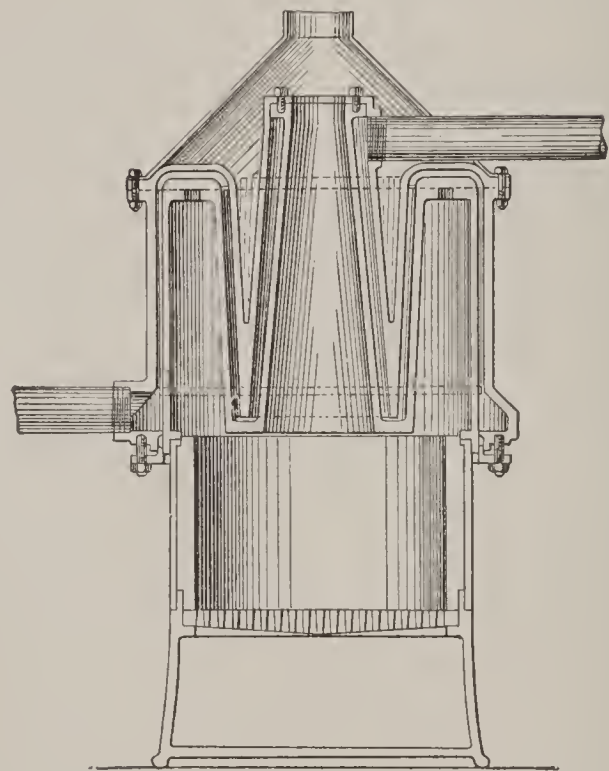
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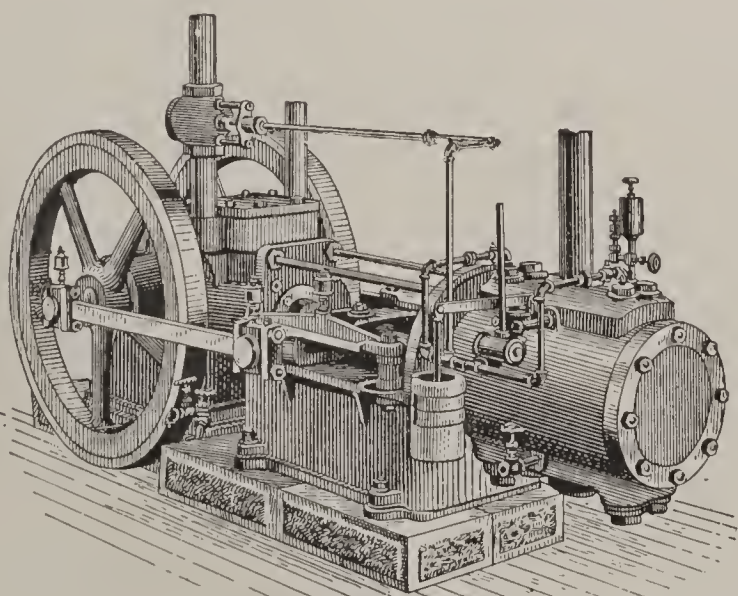
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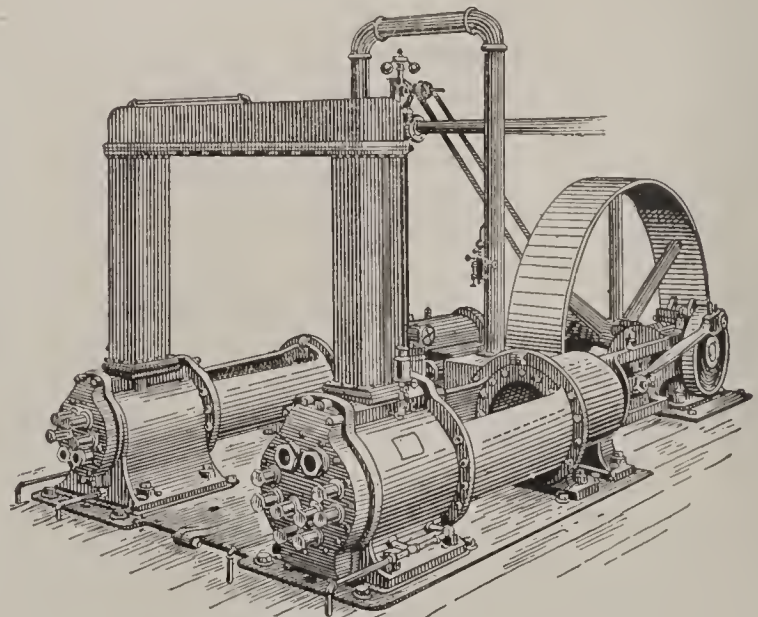
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1. DIRECT ACTING FLY-WHEEL COMPRESSOR, with yoke mechanism.
2. PISTON-INLET AIR COMPRESSOR CYLINDER, showing water-jacket.
3. STEEL CYLINDRICAL AIR RECEIVER, with safety relief valve.

4. COAL-FIRE AIR REHEATER, to reheat air before expansion.
5. SINGLE AND SIMPLE STEAM-DRIVEN AIR COMPRESSOR.
6. COMPOUND STEAM TWO-STAGE AIR COMPRESSOR, with intercooler.

standard air brake has a steam cylinder and an air cylinder of the same size, viz., $9\frac{1}{2}$ inches diameter and 10-inch stroke, set vertically one above the other, with a common piston rod. See AIR BRAKE.

It has been stated above, in referring to the bicycle pump, that air is heated by compression. The equivalent of the mechanical work done in the compression appears in the form of heat in the compressed air in a storage tank and will be given out again when the air expands. As heat causes air to expand, a cubic foot of hot air, at, say, 75 pounds pressure, will decrease in volume when cooled, and thus bring about a reduction in pressure to something less than 75 pounds. Evidently, therefore, a loss of work done in compression results from the heating of the air, unless it is used at once as hot air; and this is usually inconvenient. The amount of the loss is estimated at 21.3 per cent of the total work done in compressing air to 75 pounds pressure. To save this loss, compressors are designed with some form of device for keeping the air cool during compression. Two systems are used, by which it is attempted to keep the air cool during compression, and these systems divide air compressors into two classes, as follows: (1) Wet compressors which introduce water directly into the cylinder during compression, (a) in the form of a spray, and (b) by the use of a water piston; (2) Dry compressors, which admit no water directly into the cylinder, but have the cylinder surrounded by a jacket, into the space between which and the cylinder walls water is forced and kept in circulation. The water piston compressor is now seldom used. Cooling by the water spray injection gives the most efficient results as far as cooling the air is concerned, but it has so many objections, from the moisture which it carries, that it has been found to be the best practice to use the less efficient but vastly more simple water-jacket system and endure the loss of heat which might be saved by using water spray injection. Accordingly, most air compressors are nowadays provided with a water-jacketed air cylinder for cooling the air during compression.

Vertical air compressors have the steam cylinders placed vertically above the air cylinders; horizontal compressors have the steam and air cylinders placed horizontally one ahead of the other. Direct air compressors have the steam and air piston on the same piston rod, so that the thrust of the steam piston gives a direct thrust on the air piston; indirect acting compressors transfer the thrust of the steam piston by means of cranks and gearing to the air piston rod. A single-acting compressor is one which compresses air on the forward stroke of the air piston only, the back stroke doing no useful work; a double-acting compressor compresses air on both the forward and back strokes of the air piston. A two-stage compressor partly compresses the air in one cylinder, from which it is passed to a second cylinder, where it is further compressed. Generally, the air in passing from the first to the second cylinder passes through an inter-cooler, where it is cooled by water. Three-stage and four-stage compressors are sometimes employed for high pressures. A duplex air compressor consists of a right-hand steam and air cylinder and a left-hand steam and air cylinder, each side being capable of being run separately, or the two sides can be run together. A duplex compressor may have

either the air cylinders or the steam cylinders, or both air and steam cylinders compounded. Air compressors may have the steam cylinders replaced by an electric motor driving a crank-shaft, or the crank-shaft may carry a pulley so that they may be operated by a belt, or by a water wheel obtaining power from a head of water.

Whatever the form of compressor which is used, the mechanical action in compressing the air is that of a piston working in a cylinder, exactly as in the case of a bicycle pump. As each cylinderful of air is compressed, it is forced into a sheet-steel tank called a receiver. This receiver is best cylindrical in form, and serves as a reservoir of compressed air for supplying the machine which is operated by air pressure. The receiver is often provided with an arrangement for cooling the contained air by water. While it is advantageous, for the reason given above, to keep the air as cool as possible during compression, heating it is an advantage, as soon as it leaves the receiver, for the reason that by this heating its volume or its pressure is increased. So important is this advantage, theoretically, that devices called reheaters are often employed to heat the air just before it passes to the motor or the tool which it operates. Reheaters are made in many forms, the usual one being a kind of stove or oven through which the air passes by means of a spiral pipe or some other arrangement which allows it to be quickly heated. The utilization of compressed air for transmitting power or available energy from the compressor and reservoir to the point where power or motion is to be developed is as wide as the industries. It is clean, easy to control and manipulate, leakage is innocuous, and there is no danger from fire. It is a rival of the transmission of power by electric wires, where the motion desired is a reciprocating one or to be effected by a pressure over an area, as with a piston working a cylinder. It is reliable and not subject to short circuits or loss of its potential energy. This fits it for train-brakes, switch and signal systems, riveters and rock-drills, and for use in the foundry. It is conveniently, cheaply, and cleanly stored: this fits it for use in mines and other transportation problems; it is free from the danger of sparks in combustible atmospheres. Where air is itself required in the processes, as in aërating, oil and fuel burners, spraying, cleansing, pumping, etc., it has no substitute.

Power cannot be carried in air pipes over the distances possible with the electric system on account of pressure losses by friction, unless a size of pipe is used which is prohibitory from its cost and trouble with its joints. Air can be used in ice-making or the production of cold, by cooling the compressed air at a high pressure and allowing it to expand in an air engine, dropping its temperature as it does so. Air can be liquefied by compressing it at very low temperatures.

For the great majority of industrial uses an air pressure below 75 pounds per square inch is ample, but for charging the tanks of compressed-air locomotives, for liquefying gases, etc., much higher pressures are required. The highest known pressure to which air has been compressed is 4000 atmospheres (about 60,000 pounds) per square inch, but this was a laboratory experiment. The safe limit of pressure for use in the arts to-day is largely determined by the strength of the retaining vessel or reservoir, and has reached its limit at about 3000 pounds per square inch. To obtain these great pressures specially

designed air compressors have to be constructed, and great trouble is experienced from the cold resulting from the fall of temperature in expanding to atmospheric pressure.

For a concise and readable history of air compressors and of the use of compressed air, consult Saunders, *Compressed Air Production* (New York, 1902), or Hiscox, *Compressed Air and its Applications* (New York, 1901); for a somewhat more technical discussion of the production and use of compressed air, F. Richards, *Compressed Air* (New York, 1895); for practical use of compressed air especially in mine service, Peele, *Compressed Air Plant* (2d ed., New York, 1910). Consult also, Harris, *Compressed Air: Theory and Computations* (New York, 1910), and Thorkelson, *Air Compression and Transmission* (New York, 1913). The most thorough work in English on the theories involved in the use of compressed air is Weisbaeh's *Mechanics of Air Machinery* (New York, 1905).

AIR CUSHION, kush'un. A mattress or cushion composed of a bag or sack of air-tight fabric, which can be inflated, and which possesses many advantages of comfort, cleanliness, and portability. Air-beds were known as early as the beginning of the eighteenth century, but, being made of leather, were expensive, and it was only after the invention of air-tight or rubber cloth that they could be constructed at a moderate cost. An air-bed consists of a sack in the form of a mattress, which may be divided into a number of compartments, each air-tight, or it may have a single compartment with the walls tied to each other to preserve its shape when inflated. The bed is supplied with a valve, or valves, through which the air is blown in by a bellows or an air pump. They are especially valuable in many cases of sickness and for use by camping parties. Air-inflated pillows are made to go with the mattresses. The air-cushion is another contrivance of the same kind, the layer of rubber being securely pasted or cemented to a layer of strong cloth, the cloth giving strength and the rubber impenetrability. Air cushions are specially useful on yachts and canoes, where they may be used also as life-preservers on account of the buoyancy. The chief drawback to these contrivances is their liability to being spoiled by a rent or a puncture.

AIRD, Sir JOHN (1833-1911). An English engineer who, after the completion of his education, became associated with his father, a contractor in large undertakings. When he was only 18 years of age, John Aird was entrusted with a considerable amount of important work in connection with the Exhibition of 1857. He afterwards built many large gas and water-works plants in England and elsewhere. His most famous achievement, however, was the building of the great Assuan Dam (q.v.), of which Sir Benjamin Baker (q.v.) was the engineer. The firm of John Aird & Co., which had contracted in 1898 to build not only the dam but also the Assiut Barrage (see ASSIUT) within five years, finished the task in 1902, 12 months earlier than had been stipulated. Aird was returned in 1887 as a member of Parliament in the Conservative interest from North Paddington and held this seat until 1905. He was made a Baronet in 1901, and was decorated by the Khedive of Egypt with the Grand Cordon of the Medjidie, in recognition of his work at Assuan.—Sir JOHN AIRD, his son and successor, was born in 1861. He also was eminent as an engineer

and builder. He took part in the construction of the Assuan Dam and Assiut Barrage and was decorated with the Imperial Order of the Osmanie, second class.

AIRD, ard, THOMAS (1802-76). A Scottish poet of considerable talent. He was born at Bowden, in Roxburghshire, was educated at the University of Edinburgh, and gained the friendship of many distinguished men, especially John Wilson, who always spoke of him in very high terms. In 1835 he became editor of *The Dumfries Herald*, a new journal, started on conservative principles, an office which he filled till 1864. His works are not so well known as they deserve to be, from their intrinsic merit. In spite of very warm praise from Carlyle and others, they have failed to secure a large measure of public approbation. *The Devil's Dream* is perhaps an exception to the rest, for it is both well known and admired. There is something almost Dantesque in the stern, intense, and sublime literalness of the conception. Whether the scenes are on a large scale, as in *The Devil's Dream*, or minute, as in *The Summer's Day*, there is the same clear, vigorous, and picturesque word-painting. In 1827 Aird published *Religious Characteristics*, a piece of exalted prose-poetry; in 1830, *The Captive of Fez*; in 1845, *The Old Bachelor*, a volume of tales and sketches; in 1848, a collected edition of his poems, a second edition of which appeared in 1856, and in 1852 he edited the select poems of David Macbeth Moir (the "Delta" of *Blackwood's*), prefixing a memoir. See his life and poems, edited by J. Wallace (1878).

AIR DRAINAGE. See FROST.

AIRD'RIE (Gadhel. Smooth Height; from *aird*, height). A town in Lanarkshire, Scotland, 11 miles by rail east of Glasgow (Map: Scotland, D 4). The highroad between Edinburgh and Glasgow intersects it and forms its principal street. It has risen rapidly, was incorporated in 1821, and is now one of the most flourishing inland towns in Scotland. Little more than a century ago it consisted of a solitary farmhouse or two, but the abundance of iron and coal found in the vicinity has given its industries an immense impetus. In addition to foundries, there are cotton-weaving establishments and paper mills. When the Free Library Act was passed, Airdrie was one of the first towns to adopt its provisions. Pop., 1891, municipal borough, 19,135; 1901, 22,288; 1911, 24,388.

AIRE, âr, or **AIRE-SUR-L'ADOUR**, âr'sur'la'door'. A town of the department of Landes, France, situated on the slope of a hill on the left bank of the Adour, 112 miles south of Bordeaux (Map: France, S., D 5). It has been the seat of a bishopric since the fifth century, and its cathedral of St. Wolfram is a fine example of flamboyant Gothic, begun by Cardinal Georges Antoine, under Louis XII, but, in restoration and completion, finished in a mean and paltry style. Aire has also a college and a library. Its industries are not considerable, but tanyards and hat factories give employment to most of its inhabitants. Pop., 1896, 2434; 1901, 2247; 1906, 4303; 1911, 4025.

AIRE, or **AIRE-SUR-LA-LYS**, âr'sur-la-lès'. A town of the department of Pas-de-Calais, France, on the Lys and at the junction of three canals, 30 miles southeast from Calais (Map: France, N., H 2). The town is fortified and well built, though situated in a low, marshy region. Its chief buildings are the handsome Gothic

church of St. Peter, dating from the fifteenth century, the Hôtel du Baillage or Corps de Garde of the sixteenth century, the Hôtel de Ville, and extensive barracks. France acquired possession of Aire in 1713. It has flour mills, various domestic manufactures, and a trade in agricultural products. Pop., 1901, 8458; 1906, 7999; 1911, 8247.

AIREDALE TER'RIER, âr'dâl. See **TERBIER**.

AIR EN'GINE. See **AIR COMPRESSOR**; **COMPRESSED AIR ENGINE** AND **CALORIC ENGINE**.

AIR GUN. An instrument somewhat resembling a sporting rifle, designed to discharge darts or bullets by the elastic force of compressed air. As ordinarily made, an air gun consists essentially of an air chamber or reservoir, usually located in the stock; of a condensing syringe for pumping air into the reservoir, and of a valve operated by a trigger, which admits the compressed air from the reservoir to the barrel behind the bullet. In some weapons of this sort a pressure of as much as 500 pounds is secured in the reservoir. Usually only a portion of the air in the reservoir is used for a single shot, and therefore a number of shots may be fired without recharging the reservoir simply by releasing the pull on the trigger immediately and thus closing the valve between the reservoir and barrel after a small portion of the air has escaped. This permits repeating air guns to be made similar in the mechanism for inserting the bullets to repeating fire-arms. Obviously, the pressure in the reservoir decreases with each discharge of air, and therefore each succeeding bullet is discharged with less force than the preceding one. At best, the force with which a bullet is discharged from an air gun is much less than is given by gunpowder. Sometimes air guns are made in the form of canes or walking sticks, which, like sword canes, are carried for purposes of personal defense in sudden emergencies. The range of an air gun of the ordinary kind is from 180 to 250 feet. The air gun was known in France over two centuries ago, and the ancients were acquainted with a device by which air acted on the short arm of a lever, the longer arm of which was used to propel a bullet. In 1886 Lieut. E. L. Zalinski of the United States army invented a pneumatic gun for throwing projectiles filled with dynamite; and later the *Vesuvius* was built for the United States navy and equipped with three of these guns. This vessel was used during the blockade of Santiago Harbor in the Spanish-American War of 1898. During the Brazilian civil war of 1893 the *Nictheroy* was equipped with a pneumatic gun 50 feet long and of 15 inches calibre. The conclusions of experience with both sets of guns was that the range of the gun was too small and the accuracy of its fire insufficient to make it a serviceable weapon on shipboard. The Sims-Dudley pneumatic gun used by the insurgents in Cuba was a field piece having a range of from 2600 to 3600 yards. It consisted of a lower, or combustion, tube 7 feet long and 4½ inches in diameter, and an upper tube, or barrel, 20 feet long and 2½ inches in diameter, mounted on a regular field-gun carriage. A cartridge inserted into the breech of the combustion chamber, and containing a 7 to 9 ounce charge of smokeless powder, is fired; this compresses the air in the lower chamber so that it passes into the upper tube or barrel behind the projectile and forces it out. The projectile was a light

casing filled with explosive gelatine, fired by a time fuse, or by a contact fuse upon striking.

AIR METER. A special form of anemometer designed to measure the flow of air in mine shafts, ventilating ducts, galleries, chimneys, etc. See **ANEMOMETER**.

AIROLO, î-rô'lô (in German, **ERIELS**). A village in Switzerland, in the canton of Ticino, on the Upper Ticino, 3755 feet above the sea, 66 miles south of Lucerne, at the south end of the St. Gothard Pass and of the St. Gothard Railway Tunnel (q.v.) (Map: Switzerland, C 2). On Sept. 17, 1877, it was nearly destroyed by fire, but later was rebuilt in stone. Dec. 27-28, 1898, it was partially destroyed by an avalanche. The town is safeguarded against further disaster of this nature by the erection of embankments and the regulation of the courses of mountain streams. The inscription, "Suvarov Victor," that was carved in the rocks to commemorate the victory here of the Russians over the French, Sept. 13, 1799, is now obliterated. Pop., 1900, 1628; 1910, 1696.

AIR PLANT. See **EPIPHYTE**.

AIR PORT. See **SHIPBUILDING**.

AIR PUMP. An instrument for removing the air from a vessel. These pumps may be divided into two classes, mechanical air pumps and mercurial air pumps. The mechanical air pump was invented by Otto von Guericke about 1654, and a specimen of his early apparatus is shown in Fig. 1 of the accompanying page illustration. In Fig. 2 is illustrated a modern simple air pump whose essential part is a hollow brass or glass cylinder, in which an air-tight piston is made to move up and down by a rod. From the bottom of the cylinder a connecting tube leads to the space which is to be exhausted, which is usually formed by placing a bell-glass, called the receiver, with edges ground smooth and smeared with lard, on a flat, smooth plate or table. When the piston is at the bottom of the barrel and is then drawn up, it lifts out the air from the barrel, and a portion of the air under the receiver, by its own expansive force, passes through the connecting tube and occupies the space below the piston, which would otherwise be a vacuum. The air in the receiver and barrel is thus *rarefied*. The piston is now forced down, and the effect of this is to close a valve placed at the mouth of the connecting tube and opening inward into the barrel. The air in the barrel is thus cut off from returning into the receiver, and as it becomes condensed forces up a valve in the piston, which opens outward and thus escapes into the atmosphere. When the piston reaches the bottom and begins to ascend again, this valve closes; and the same process is repeated as at the first ascent. Each stroke thus diminishes the quantity of air in the receiver; but from the nature of the process it is evident that the exhaustion can never be complete. Even theoretically there must always be a portion left; and practically the process is limited by the elastic force of the remaining air being no longer sufficient to open the valves. The degree of rarefaction is indicated by a gauge, on the barometer principle.

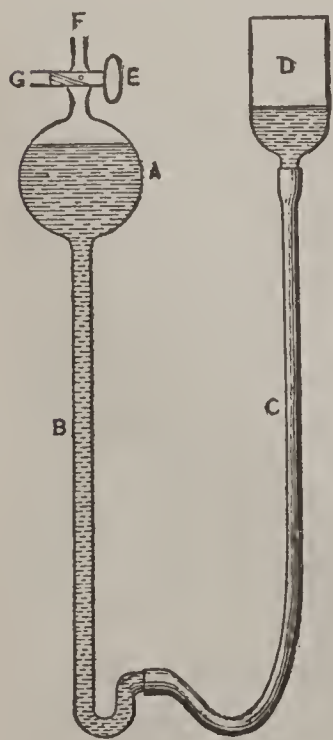
As this air pump only withdraws the air at the rate of one cylinder full for a double stroke of the piston, pumps with two barrels are frequently used, in which case the pistons are each attached to the same handle, but each moves in an opposite direction to the other, the object being to double the work done at each stroke of

the handle. Such a pump is illustrated in Fig. 5 of the page plate. A large number of modifications of this type of pump have been invented, all of which are the same in general principles. There are several reasons why such pumps do not continue the process of rarefaction indefinitely, but after a certain stage their effects cease and the tension of the air undergoes no further change. Leakage at various joints in the pump is one limiting cause to the action of the machine. As the exhaustion proceeds the leakage is faster on account of the reduced pressure in the receiver, and finally a limiting point is reached when the inflow and outflow are equal and no reduction in the tension of the air takes place. Another limit to the action of this machine is caused by the fact that there must always be some space between the bottom of the piston and the lower end of the cylinder, which is untraversed by the piston.

A greatly improved type of mechanical air pump, known as the Geryk, in which the piston and valves are always covered with a quantity of oil, so that the pump has virtually a liquid piston and liquid valves, has recently come into wide use for commercial and laboratory purposes. The oil used in the cylinder must have a very low vapor tension, which requirement is met by oils of high boiling point. With a pump of this sort, having two cylinders working in series, a vacuum of $1/500,000$ of an atmosphere may be rapidly obtained. In the Rose air pump the piston rod is eliminated, as an iron piston moved by electro-magnets oscillating outside of the pump is employed.

For the production of very high degrees of exhaustion, the more slowly working mercurial air pump is used. The principle of the mercurial air pump was first known in the seventeenth century, when Torricelli showed how to produce a vacuum by filling a tube over 30 inches long and closed at one end, with mercury, and then inverting the tube, with the open end temporarily closed, in a vessel containing the same liquid. The mercury in the tube then descends to a height equal to that of the barometer above the level of the mercury in the lower cup, and a vacuum is left in the top of the tube. This is always

alluded to as a Torricellian vacuum, and is found in the ordinary barometer. In 1855 Geissler invented a mercurial air pump in which the vacuum is produced by connecting a receiver with a Torricellian vacuum. The original form of Geissler's pump is shown in the accompanying diagram, which will serve to illustrate the principle of the operation of pumps of this class, though they have received numerous modifications and improvements. In most mercury pumps the parts are made of glass, the connections being made with rubber tubing. In the diagram, *A* is



GEISSLER PUMP.

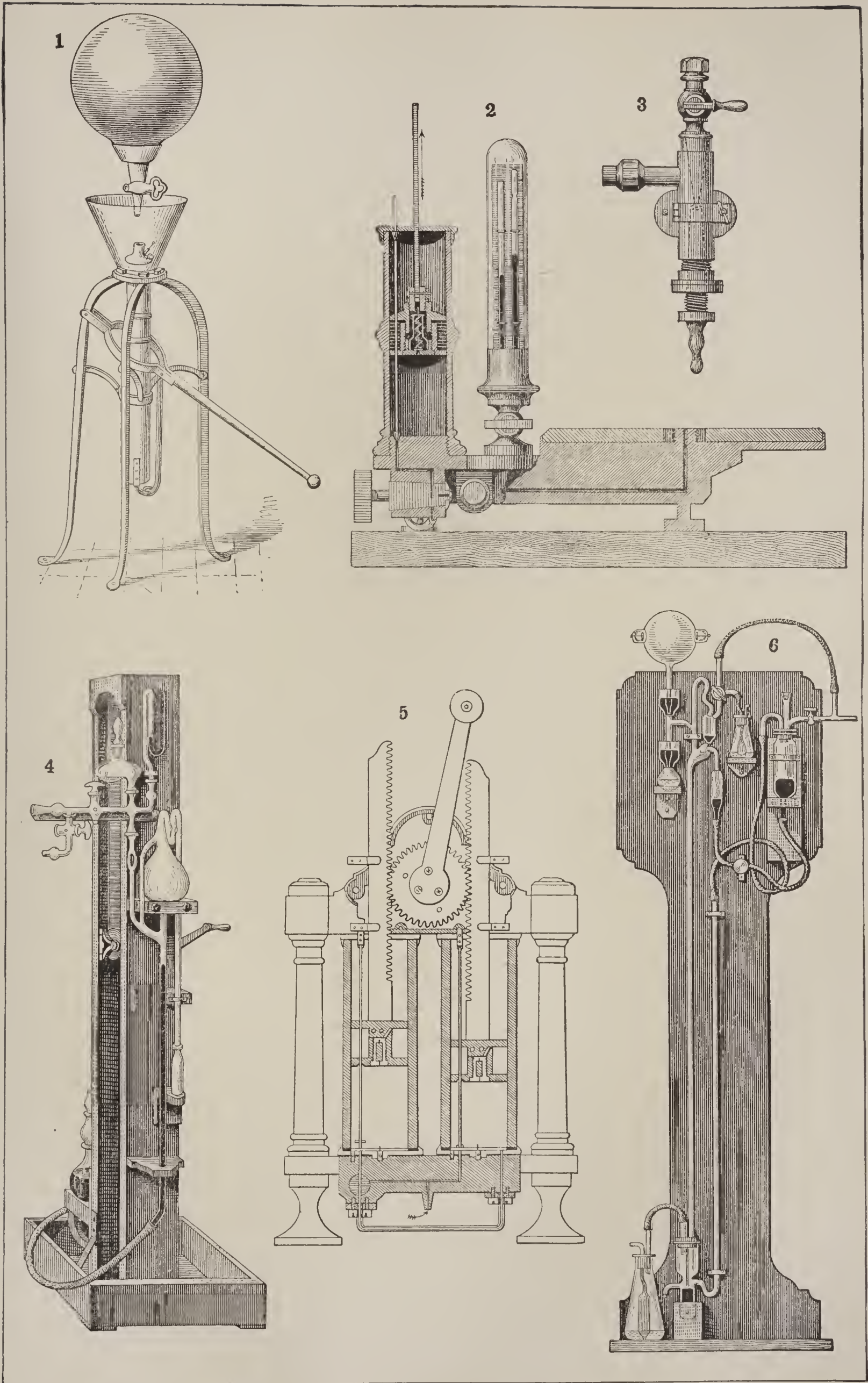
about 3 feet long, *C* a rubber tube uniting the lower end of *B* with the vessel *D*, which is open

on top. *A* can be connected with either of the tubes *G* or *F*, but not with both at once, or it can be shut off from both. The receiver to be exhausted is connected with *G*, and *F* leads to the open air. Enough mercury is used to fill *A*, *B*, *C*, and *D*, as shown, and the vessel *D* is capable of being raised or lowered. The operation of the pump is as follows: Suppose the vessel *D* is raised a little higher than *A*, as in the figure. The mercury will flow into the bulb *A*, which it fills if the cock *E* is turned so as to connect *A* with the outside air, *F*. The cock is then turned so as to connect *A* through the tube *G* with the vessel to be exhausted, the air in which at this stage is at atmospheric pressure. *D* is then lowered, and the level of the mercury in *A* is lowered in consequence, the mercury running down *B* and *C* to *D*. As the mercury in *A* descends, air is drawn from the receiver through *G* into *A*, so when the mercury has descended below *A* the whole space is filled with the air drawn through *G*, which, having expanded from the receiver attached to *G*, is at less than atmospheric pressure. The cock *E* is then turned so as to cut off communication between *A* and *G*. *D* is then slowly raised, and the mercury flows gradually back into *A*, compressing the air above it until it is at atmospheric pressure. At this point the cock *E* should be turned to connect *A* with the outside air *F*, and as *D* continues rising the mercury continues to drive out all the air at *F*, until the bulb *A* is filled with mercury to the cock *E*, which is then closed so as to cut off all communication with *A*. When *D* is again lowered, the mercury does not begin to fall in *A* until *D* is about 30 inches below *A*. It then begins to descend, leaving a Torricellian vacuum above it, and *D* is lowered until *A* is empty. The cock is then turned so as to connect *A* with the receiver through *G*, and the remaining air in that vessel expands and fills *A*. The cock *E* is next turned off, *D* is raised, and the mercury rising in *A* compresses the air above it until it is let out at *F* by turning the cock. By repeating this operation a sufficient number of times a vacuum is gradually produced in the receiver connected to *G*. When the operation is nearly finished, great care must be taken not to raise the vessel *D* too rapidly, or the impact of the mercury against the top of the bulb *A* will break the apparatus. It will also be seen that when the vacuum is nearly reached the mercury in *A* will be at the top of the bulb when *D* is about 30 inches below. If the valve should be turned to *F* at this point, the inrush of air would drive the mercury down. Therefore no communication between *A* and *F* must be made until *D* has been raised on a level with *E*, and no communication between *G* and *A* must be made until *D* is lowered 30 inches again, otherwise mercury will run through *G* into the receiver which is being exhausted.

The Geissler pump just described may be taken as the type of mercury pumps, which are classified as upward driving, and, while a number of improvements in details have been introduced, making them of a more practical type for factory use, these pumps all operate on the principle of connecting the receiver to be exhausted with Torricellian vacuum.

Sprengel brought out his well-known form of mercury pump in 1865, and the diagram shows it in its simplest form. The Sprengel pump is a general type of what are classified as downward-driving pumps. *A* is a funnel having a stop-cock

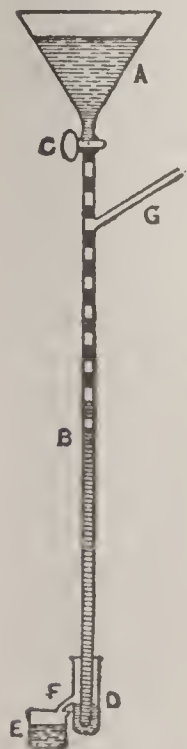
AIR PUMPS



1. APPARATUS OF OTTO VON GUERICKE with water receptacle at base removed.
 2. SECTION OF SIMPLE AIR PUMP.
 3. BUNSEN WATER PUMP.

4. MERCURIAL AIR PUMP, Töpler-Hagen form with improvements.
 5. MECHANICAL AIR PUMP, with two vertical cylinders.
 6. SELF-ACTING SPRENGEL MERCURIAL AIR PUMP, with auxiliary water pump.

C, and *B* is a tube of small bore, called the shaft or fall-tube. The receiver to be exhausted is connected to the tube *G*, which branches off from near the top of the shaft. The tube *B* terminates very close to the bottom of the vessel *D*, which is provided with a spout *F*, as shown, leading to the cup *E*. The distance from the branch *G* to the top of the mercury in the vessel *F* must be at least 3 feet. *A* is filled with mercury, which flows down the shaft *B*, the rate of flow being regulated by the cock *C*, so that a very small stream is allowed to fall. This mercury in falling breaks up into short lengths, between which are small columns of air which flow in at the junction of *G* with the shaft *B*. The weight of



SPRENGEL
PUMP.

the mercury forces these short columns of air down the shaft *B* to the mercury in *D*, from the surface of which they escape. The mercury as it runs into the cup *E* must be poured back into the funnel *A*. This operation continues until no more air is carried down with the mercury. When the vacuum is nearly completed, the mercury in the fall-tube will fall with a sharp, rattling noise, showing that there is not enough air carried down with it to act as a cushion.

With all kinds of mercury pumps, however, it is necessary to continue the operation for a considerable time after the receiver is apparently exhausted. Even when no more air appears to be carried on by the pump, the vacuum will improve as the operation continues. The reason for this is that the air sticks to the surface of the glass, forming a sort of coating, which is swept off the surface by the pump, but very slowly. The simple form of Sprengel pump is better than the simple Geissler pump, but is not well suited to factory work on account of the slowness of its action. The drawback is overcome, to a great extent, by supplying the pump with a number of fall-tubes, which act together as a single one. For example, if six fall-tubes are used, the work of removing most of the air is done in one-sixth of the time required by a single pump. After the greater part of the air is removed, however, the time taken to produce a good vacuum is not nearly so much reduced, and it is chiefly in the early part of the operation that the saving of time is effected. Another drawback to all mercury pumps is their liability to breakage, even with the most careful usage. In the Sprengel pump, owing to the continual hammering of the mercury, the fall-tubes are very often broken, even after only a very short usage. A method is in use with both of these forms of pumps which consists of exhausting into a partial vacuum instead of into the atmosphere. This is accomplished by inclosing the part of the apparatus where the air is expelled in a chamber which is kept at a partial vacuum by means of a mechanical or water air pump. By this means the mercury pump will work against a pressure much less than the atmospheric pressure, and consequently the fall-tubes and the height to which the mercury must be raised can be very much reduced, while the air is much more readily drawn down and out of the fall-tubes.

In factory work the raising of the mercury from the lower to the upper level of the pumps

is done mechanically and not by hand. It may be raised by a force-pump, or in small buckets on an endless chain, or by air pressure. The latter may be simply atmospheric pressure, and the mercury is raised by being broken up into small lengths with air spaces between, like a Sprengel pump working upward into a vacuum chamber. The illustrations show modern forms of mercury pumps. In an improved form of Sprengel pump designed by G. W. A. Kahlbaum a steel gun-barrel replaces the glass fall-tube. This avoids the electrification of the glass by the friction of the falling mercury, and with the other improvements introduced enables a higher vacuum to be attained than ever previously. In this way, in 1901, he was able to obtain a degree of exhaustion corresponding to a pressure of .0000018 millimeters of mercury, which at that time was considered the best on record.

For much experimental work it is necessary to employ some form of continuous running air pump in order to maintain a satisfactory vacuum, and a rotary arrangement of the mercury pump has been found useful in most cases. Such a device was first developed by Schultze-Berge and underwent numerous modifications; that of Kaufmann, brought out in 1905, while fragile and complicated, was very efficient. Here the mercury is contained in an inclined spiral tube which is rotated so that at each revolution a fraction of the air in the vessel under exhaustion is cut off.

Later important improvements in air pumps were due to Dr. W. Gaede. One of his pumps consisted of an outer and closed drum half filled with mercury, which rotated a second drum divided into chambers connected with the vessel to be exhausted. As the drum is rotated, the chambers are filled alternately with gas and mercury, the former being displaced into the outer space between the two drums and there cut off by the mercury. This machine has been aptly compared to a form of gas meter where the moving gas affects the rotation of the mechanism, only in the rotary pump the gas is set in motion by the rotation of the drum. It is necessary with this pump first to make a rough exhaustion by preliminary pumping, so that the difference of pressure between the outside and inside of the rotating drum is not sufficient to drive the gas back into the drum.

Dr. Gaede also designed a mechanical pump which departs radically from the Guericke principle, as it maintains at all times an open connection between the vessel to be exhausted and the delivery pipe. It is known as a molecular air pump and consists of a rapidly rotating cylinder which serves to drag the gas along by the movement of its surface within a slightly larger cylinder so that a difference of pressure is established between two openings on opposite sides but connected by a slot. In actual construction a grooved cylinder is used with a tongue projecting into the groove, and a number of grooves are employed, the apparatus being compounded so that the low-pressure side of one groove is the high-pressure side of the previous one. Preliminary exhaustion is required with this pump, but it works as well with vapors as it does with gases, and no drying is required. At a speed of 12,000 revolutions per minute a vacuum corresponding to .0000002 (2×10^{-7} millimeters of mercury) was obtained, which at the time became easily the best record for exhaustion. The higher the speed the greater the

exhaustion. The mechanical air pump works ten times faster than the rotary mercurial air pump and puts at the command of the investigator the very highest vacua.

The degree of exhaustion obtained with various types of air pumps may be seen from the accompanying table, compiled by Andrade in 1913 and published in *Nature* with an article on "Modern Air Pumps."

TABLE OF COMPARATIVE EXHAUSTION OBTAINED WITH VARIOUS TYPES OF AIR PUMPS

Pump.	Pressure in millimeters of mercury.
Water pump	10.
Ordinary piston pump	1.
*Older Geissler pump .....	.1
*Newer Geissler pump .....	.01
*Sprengel pump .....	.001
*Modified Toepler pump .....	.00001
Kahlbaum's automatic mercury pump	.000002
Geryk oil-filled pump .....	.0002
Gaede rotary mercurial pump .....	.00001
Gaede molecular pump .....	.0000002

The water pump invented by Bunsen is a simple form of apparatus that is found generally in physical and chemical laboratories and adequately answers when too high a degree of exhaustion is not required. It consists of a tube attached to a faucet or other supply of water under pressure, through which water empties into a chamber provided with two outlets. From one of these the water flows out, carrying with it the air from the vessel to be exhausted, which is connected with the second tube. In its original form this piece of apparatus was made of glass and rubber tube, but with metallic parts that allow it to be connected to an ordinary faucet. It is extensively used in laboratories. The page illustration (Fig. 3) shows one form of such a water pump.

Bibliography. Descriptions of air pumps of various forms are to be found in all the large treatises on physics, including those of Ganot, Deschanel, Müller-Pouillet, and Winkelmann (1886), the two last named (in German) giving a complete account of the most important types of apparatus of this class. In the *Journal of the Society of Arts*, vol. xxxvi (London, 1888), there is an interesting and valuable article on "The Development of the Mercurial Air Pump," by S. P. Thompson, in which the various forms of this instrument are described. This has been reprinted in book form. For the most recent achievements in air pumps and high-vacua apparatus the reader is also referred to the columns of the *Annalen der Physik und Chemie*, *Berichte der Deutschen Physikalischen Gesellschaft*, *Physikalische Zeitschrift*, *Zeitschrift für Instrumentenkunde*, *American Journal of Science*, and *Science Abstracts*. For AIR COMPRESSORS, see under that title.

AIR RESISTANCE OF A PROJECTILE. See BALLISTICS.

AIR SHIPS. See AERONAUTICS.

AIRY, âr'î, Sir GEORGE BIDDELL (1801-92). An English astronomer. He was born at Aln-

* These values are taken from Winkelmann's *Handbuch der Physik*, vol. i, and are to be considered rough, but afford some comparison of the degree of exhaustion to be obtained with the various types. The compiler states that it is very doubtful whether Kahlbaum's pump can give better vacuum than Gaede's mercury pump, the figure for which is given by the Physikalisch-Technische Reichsanstalt.

wick, Northumberland, and graduated at Trinity College, Cambridge, in 1823. In 1825 he discovered the optical defect of astigmatism and provided a corrective for it. He was elected to the Plumian professorship at Cambridge in 1828 and intrusted with the management of the Cambridge Observatory, the results of his labors being published in the compilation entitled *Astronomical Observations* (9 vols., Cambridge, 1829-38), which became the model of all analogous works since published in Great Britain. In 1835 he succeeded Pond as royal astronomer of the Greenwich Observatory, where he introduced or perfected numerous astronomical instruments, devised clearer and quicker methods of calculation, and instituted valuable researches in magnetism, meteorology, and photography. One of his most important achievements was the establishment of a mechanical device in the form of magnets and iron, whereby the disturbance of the compass in iron-built vessels can be rectified. It was he, also, who conducted the astronomical observations preparatory to the definition of the boundary between Canada and the United States. Among the works written by this distinguished scientist during his exceptionally long and useful career, the following are especially noteworthy: "Gravitation," for the *Penny Cyclopædia*, also published separately (1885); *Mathematical Tracts on Physical Astronomy* (4th ed., 1858); *Ipswich Lectures on Astronomy* (4th ed., 1858); *Treatises on Errors of Observation* (1861); *Sound* (1869); *Magnetism* (1870); "Trigonometry," "Figure of the Earth," "Tide and Waves," in *Encyclopædia Metropolitana*.

AISHA. See AYESHAH.

AISLE, il (Fr. *aile*, wing, from Lat. *ala*, contracted from *axilla*). One of the longitudinal divisions in a building divided internally by parallel rows of columns or piers. In strictest parlance, the term should apply only to the lateral divisions on either side of a central division which is usually broader and higher than the others; but in general usage these are called the "side aisles," and the central division the "central aisle." On the other hand, the term "nave," often applied to the whole of the central aisle, strictly belongs only to that part of it west of the chancel or transepts. (See NAVE.) The intersection of the central aisle of the nave and choir with that of the transept is called the "crossing." The hypostyle halls of Egyptian temples offer the earliest examples of aisled construction; that at Karnak having eight aisles on either side of the central aisle. A few of the Greek temples (e.g., the Parthenon at Athens, temple of Poseidon at Pæstum) were three-aisled. It was the Romans, however, who developed a distinctive architectural treatment for aisled structures, in their basilicas or public halls. In these the central aisle was made much wider and higher than the side aisles, and lighted by a row of windows on either side above the side-aisle roofs; this is called a "clearstory," of which the prototype is seen in the hall at Karnak already mentioned. Some of the Roman basilicas were five-aisled (i.e., with two side aisles on either side of the central aisle), as the Julian and Ulpian; more often they were three-aisled. See BASILICA.

The mediæval type of Christian church west of the Byzantine Empire was derived from the Roman secular basilica, both in plan and, in the earlier centuries, in construction also, with the addition of a transept or transverse arm or aisle in front of the sanctuary or chancel. The intro-

duction of vaulting in the Romanesque period (tenth to twelfth centuries), applied at first only to the side aisles, but later also to the central aisle of nave and choir, operated to change completely the aspect, construction, and proportion of all the aisles, but without affecting the fundamental plan. (See CHURCH.) In the Gothic period (twelfth to sixteenth centuries) the height of all parts was greatly increased, and the clearstory, especially in France, made more important; one, and in some cases two, side aisles were continued around the apse to form ambulatories (see AMBULATORY); and the outer aisles of the choir, sometimes also of the nave, flanked with chapels. The cathedral of Antwerp has seven aisles; those of Cologne, Milan, Seville, Paris, Bourges, the great church of St. Sernin at Toulouse, and some others have five aisles; Rheims, Chartres, Amiens, and Beauvais have five-aisled choirs; the great majority of Gothic churches and many Renaissance churches have three aisles. Many transepts are without side aisles; some English cathedral transepts have only one side aisle, as at Salisbury: a few churches carry the side aisle entirely around the transepts, as St. Sernin at Toulouse and San Spirito at Florence.

The side aisles next the central aisle are in many cases two-storied, the upper story forming a spacious gallery on either side, as in Notre Dame, Paris, and in some of the Roman Christian basilicas (Sant' Agnese fuori le Mura). In Bourges Cathedral the inner aisles are of the height of two stories, having clearstory windows above the roofs of the outer aisles, but are without galleries.

The term is often applied, in common usage, to the passages between sections of seats in halls and churches; in this sense it appears to be derived from the French word *allée*, a passage.

AISNE, ān. A river in north France, a tributary of the Oise. It rises in the Forest of Argonne, flows northwest for the first two-fifths of its course, and then west to its junction with the Oise above Compiègne (Map: France, N., J 3). Its length is 170 miles, of which over three-fifths are navigable, either directly or by means of a canal parallel to its course. It is connected with the Meuse and Marne rivers by canals.

AISNE, ān. A department on the Belgian frontier of France (q.v.), formed of parts of the old Picardie, Bril, and Ile-de-France (Map: France, N., J 3). There are many navigable rivers, and the fertile soil is well adapted to agriculture and pasturing. The surface is rolling, and there are some forests. Manufactures are extensive. Capital, Laon. Pop., 1911, 530,226.

AISSE, ä'ê-sá', or **HAIDEE**, MADemoiselle (1694?-1733). A French writer, born in Circassia. She was taken captive by a Turkish marauding expedition and about 1698 was bought at the Constantinople slave market by the Comte de Ferriol, the French ambassador. She was educated at Paris, where she was subsequently a prominent figure in many salons. Her letters to Madame Calandrini were first published in 1787, with notes by Voltaire. In 1847 a critical edition was published by M. J. Ravenel, with a study by Sainte-Beuve. A still later edition is that with a study by Eugène Assé (1873). See also the essay by Edmund Gosse in his *French Profiles* (London, 1905).

AISTULF, is'tulf, or **ASTOLF**, äs'tölf (died 756). A King of the Lombards. He succeeded

Rachis, who entered a monastery in 749. In 751 he seized Ravenna and soon after attempted to capture Rome. The Pope, unable to get aid from the Emperor at Constantinople, went to implore assistance from Pepin (q.v.). The latter, in 754, invaded Italy, defeated Aistulf, and forced him to promise to give up the conquered territory. This Aistulf did not do, but in January, 756, laid siege to Rome. Pepin again went to aid the Pope, besieged Aistulf, who had left Rome on learning of Pepin's advance, in Pavia, and forced him to surrender the Exarchate of Ravenna. (See DONATION OF PEPIN.) The dates, which were disputed, are discussed in Gregorovius, *City of Rome in the Middle Ages*, vol. ii (London, 1896).

AITKEN, ät'kën, ROBERT (1734-1802). A Scotch-American printer and bookseller. He was publisher of the *Pennsylvania Magazine*, or *American Monthly Museum*, in 1775 and 1776, and in 1777 was imprisoned as a sympathizer with the Patriot cause. At a considerable loss he printed the first American edition of the Bible (1782), which since has become very rare. He is supposed to have written *An Inquiry Concerning the Principles of a Commercial System for the United States* (1787).

AITKEN, ROBERT GRANT (1864-). An American astronomer, born at Jackson, Cal., and graduated from Williams College in 1887. He became successively instructor in mathematics in Livermore College, Cal. (1888); professor of mathematics and astronomy at the University of the Pacific (1891); and astronomer at the Lick Observatory (1895). For several years, also, he lectured on astronomy at the summer session of the University of California. He was a member of the Lick Observatory Eclipse Expedition to the Flint Islands in 1898. As a recognition of Aitken's discovery of over 2400 double stars, the Academy of Sciences of France awarded him the Lalande prize in 1906. He became a member of many astronomical and other scientific societies. From 1897 to 1908 he edited the publications of the Astronomical Society of the Pacific, becoming known also as a contributor to American and German astronomical journals.

AITKEN, Sir WILLIAM MAX (1879-). A British capitalist and politician. He was born in Newcastle, New Brunswick, Canada, and educated in the public schools. He began his business career in Halifax, Nova Scotia, but in 1907 removed to Montreal, where his ability as a financier and organizer of industrial combinations soon made him prominent. In 1910 he removed to London, England, where he became a director in several capitalistic enterprises. In Canada he was an ardent Conservative and Imperialist, and he continued his political activity in England, actively supporting the Unionists. He was elected member of Parliament for Ashton-under-Lyne in 1910 and was knighted in 1911.

AITKEN, WILLIAM HAY MACDOWALL HUNTER (1841-). A Church of England preacher, born in Liverpool, Sept. 21, 1841; B.A., Oxford, 1865, M.A., 1867. Since 1877 he has been general superintendent of the Church of England Parochial Mission Society, which he founded in 1876. He is one of the most eminent and successful of revival preachers. His publications consist of sermons. In 1900 he was appointed canon of Norwich.

AITKENITES. In the Church of England,

the partisans of Robert Aitken (1800-73), a clergyman who had been for a time a Wesleyan and who, after 1840, having returned to the Established Church, desired to combine with its ecclesiastical practice certain views of the Methodists, especially in regard to conversion.

AITKIN, ROBERT I. (1878—). An American sculptor. He was born in San Francisco and studied for a year with Douglas Tilden, receiving the gold medal of the Mark Hopkins Art Institute of that city. Though but 18 years of age, at the advice of his teacher, he established a studio of his own. His earliest commissions were the bronze portals of the Charles H. Crocker mausoleum and the spandrel of the Spreckels music pavilion in Golden Gate Park. Among his other works in San Francisco are the Dewey monument in Golden Gate Park and the statue of Hall McAllister in front of the city hall. He afterwards spent several years in Paris, where his "Athlete" (1807) won great success, and where he began his ambitious but still uncompleted composition, "To Those Born Dead." On his return to America he established himself in New York. Among his later works are the busts of David Warfield, George Bellows, Augustus Thomas, and ex-President Taft (1910); "The Flame" (1908) which won the prize for sculpture and made him an associate of the National Academy; "A Creature of God till now Unknown," carved directly from the marble without previous study; "Michelangelo at work upon his statue of the Day" (1912). His latest works include a bronze bust of Professor Shaler of Harvard and the doors for the mausoleum of the late John W. Gates in New York. Aitken is unrivaled among the younger American sculptors in strength and originality of conception and technique.

AITON, ā'ton, WILLIAM (1731-93). A Scotch botanist. He was trained as a gardener, and in 1754 became assistant to Philip Miller, superintendent of the garden at Chelsea. In 1759 he was made director of the royal botanical gardens at Kew, which he rendered the richest in existence, and held the place until his death. In 1793 he published his excellent work, *Hortus Kewensis, or a Catalogue of the Plants Cultivated in the Royal Botanical Gardens at Kew*. This was re-edited by his son and successor in office, William Townsend Aiton.

AIVALIK, i'vá-lék', or AIWALYK. A seaport town on the western coast of Asia Minor, on the Gulf of Adramyti, opposite the island of Mitylene (Map: Turkey in Asia, B 3). It has a large trade in oil and grain, and many of the inhabitants are engaged in fishing. Its harbor is extensive, but the entrance is very shallow. The town suffered terribly at the hands of the Turks at the beginning of the nineteenth century, but has recovered since and is now of considerable importance. Its population, estimated at 25,000, is almost exclusively Greek.

AIVAZOVSKI, i'vá-zöf'skê, IVAN KONSTANTINOVITCH (1817-1900). A Russian marine and landscape painter. He was born in Feodosia, in the Crimea, of Armenian descent, was admitted as an imperial pensioner to the Academy of Art at St. Petersburg, and completed his studies at Rome. He traveled widely, especially in Russian and Turkish dominions, making studies for his 4000 pictures. Best known of Russian marine painters, he constantly enjoyed the imperial patronage, but to present-day criticism his color often seems glaring and violent, his effects

pyrotechnic. His best works include: "Sunrise on the Black Sea" (1850); "Creation," "Deluge," and several others, now at the Hermitage at St. Petersburg (1865); "Sea Fights at Revel, Viborg, and Tchesme," "Wreck of the Frigate Ingermannland," "Peter the Great at Krasnaya Gorka" (all at the Winter Palace, St. Petersburg); "View of Constantinople," "Calm Sea," and "Naples by Moonlight" (Academy of St. Petersburg); "Solar Eclipse" (Geographical Society, St. Petersburg); "Lighted Castle on the Sea" (Peterhof); "Calm Sea by Moonlight," "Monastery of St. George" (Moscow Museum).

AIWALYK. See AIVALIK.

AIX, âks or âs (anciently Lat. *Aquæ Sextiæ*, Springs of Sextius). A town of France, formerly the capital of Provence, now the capital of an arrondissement in the department of Bouches-du-Rhône (Map: France, S., K 5). The principal buildings of the town are the Palais de Justice, the Hôtel de Ville, and the cathedral of St. Sauveur. The cathedral dates from the eleventh century and is a fine example of Romanesque architecture. The Palais de Justice was not completed until 1831 and is in the Renaissance style. The town is very bright and cheerful in appearance, and its many squares and parks enliven every quarter. Aix is famous for its springs and natural fountains. That of the Rotunda is decorated with statues of Justice, Agriculture, and Art; another fountain is surmounted by a statue of René of Anjou, the patron of troubadours. It is the work of David d'Angers. There is a museum of antiquities containing valuable Gallic, Roman, and Christian remains. The town has a university in conjunction with Marseilles (see AIX, FACULTÉS D'), as well as an academy of sciences. Its library is famous in southern France, and contains about 150,000 printed works and over 1200 manuscripts; among the latter are many letters of Mary Stuart. There are also a school of art, and a picture gallery, in which are examples of Granet, the great architectural painter, who was a native of Aix. The industry of the town consists chiefly in the cultivation of the olive, in cotton-spinning, leather-dressing, and trade in oil, wine, almonds, etc. The warm springs are slightly sulphurous, with a temperature from 90° to 100° F., clear and transparent, with a slightly bitter taste. They have the reputation of improving the beauty of the skin.

Aix was in Roman times *Aquæ Sextiæ*, from Caius Sextius Calvinus, who in 123 B.C. headed the Roman colony which had been formed to defend the Greeks of Marseilles against the Salluvii. The field on which Marius defeated the Teutones and Ambrones, in 102 B.C., lies in the plain between Aix and Arles. In the Middle Ages, under the counts of Provence (see RENÉ), Aix was long a centre of art and learning. With the rest of Provence, Aix fell to the French crown in 1487, and from 1501 to 1789 it was the seat of the Parlement of Provence. Communal population, 1901, 29,418; 1911, 29,836, including agglomerated population, 19,462, scattered, 5466, counted aside, 4908.

AIX, or AIX-LES-BAINS, -là'bän' (Fr. the Bath Waters or Springs; see below). A small town of Savoy, France, in a delightful valley near Lake Bourget, 7 miles north of Chambéry and 18 miles by rail north of Marseilles (Map: France, S., K 3). It has an altitude of 850 feet. Its celebrity as the source of medicinal waters dates from its occupation by the Romans, who

gave it the name of *Aquæ Gratinæ* and built splendid baths there. Among its remains are the Arch of Campanus and the ruins of a temple and of a *vaporarium*. The resort was neglected during the Middle Ages, but began to be frequented again in the seventeenth century, and it is now a fashionable watering-place. The two hot springs are of sulphurous quality and of a temperature above 100° F. The water is used both for drinking and for bathing. There are several schools, colleges, and museums. Flour milling and the manufacture of hats, oil, and confections are among the industries of the town. Pop., 1901, 5349; 1906, 8679; 1911, 8934.

AIX, FACULTÉS D', fá'kul'tá' dâks' or dâs', or **ACADÉMIE**, á'ká'dâ'mé'. Schools of law and theology existed at Aix perhaps at the beginning of the thirteenth century. They were organized in 1409 by Papal bull into the University of Aix, which represented Provençal learning, if not literature, during most of its existence from its foundation until its dissolution in 1789 and reorganization under Napoleon in 1806, after which for nearly a century it was an academy of the University of France. The present University of Aix-Marseilles has faculties of law and literature at Aix, and faculties of science, medicine, and pharmacy, and the free faculty of law at Marseilles. There are over 1200 students.

AIX-LA-CHAPELLE, -lá-shá'pél', Ger. **AACHEN** (named from its springs, Lat. *Aquæ*, and the palace chapel). A city of the Prussian Rhine Province, and capital of the government district of the same name, situated in a valley near the river Wurm, about 40 miles west of Cologne, at the Dutch and Belgian frontiers (Map: Prussia, B 3). The city is divided into the inner or old town, the outer or new town, and Burtscheid (incorporated with it in 1897). The streets are generally broad and well paved. Among the principal ones are the Theaterstrasse, Hochstrasse, and Wilhelmstrasse. The most important public squares are the Marktplatz, with the bronze statue of Charlemagne, the Münsterplatz, and the Kaiserplatz, with a large, handsome fountain. Its private houses are for the most part handsome modern buildings and give the city a thoroughly modern appearance. With the exception of its two or three public buildings and churches, little of the ancient town remains. Its former ramparts have been leveled and turned into promenades, and only two of its old gates remain standing. Foremost among the public buildings of interest is the cathedral, a most striking specimen of various styles of ecclesiastical architecture. The oldest portion, which probably dates from the year 796 A.D., is an octagonal chapel, surrounded by a gallery and surmounted by a cupola built in the Byzantine style. A stone slab in the floor marks the traditional burial place of Charlemagne, but the supposed bones of the Emperor are preserved in a shrine in the Hungarian Chapel north of the octagon. Above the slab hangs an immense chandelier of gilded copper, presented by Frederick Barbarossa in 1168. The choir, dating from the fourteenth century and built in the Gothic style, marks the second period of construction. The Hungarian Chapel, built in the early part of the eighteenth century, contains the sacred relics, which are exhibited to the populace every seven years. The other churches of great age are those of St. Foillan and St. Paul, with fine stained glass windows. In the Marktplatz stands the Gothic Rathhaus, built (1353-70) on the

site of Charlemagne's palace, and containing the famous coronation hall (143 feet by 61 feet) of the German emperors, decorated with frescoes depicting scenes from the life of Charlemagne. The Rathhaus is flanked by two towers, one of which, the Granusturm, dates from the thirteenth century. These towers, nearly destroyed by fire in 1883, were restored in 1902.

The city's affairs are directed by a municipal council of 30 members and an executive board of five. Aix-la-Chapelle has an excellent system of sewers, which carry the refuse into the river. The city has owned and operated since 1880 large water works, which net it annually about \$35,000. The gas works are in the hands of private companies which pay the city a tax of about half a cent for each cubic meter sold for lighting purposes and about a quarter of a cent on each cubic meter sold for cooking purposes. The city owns an electric-light plant, which, however, is leased to a private company. Aix-la-Chapelle has several parks and promenades, including a municipal botanical garden. Its educational institutions include free gymnasia, a splendidly equipped technical high school, an industrial high school, an art school, a teachers' preparatory school, and a deaf and dumb school. There are six public libraries, including the municipal library, containing about 100,000 volumes. The commerce of Aix-la-Chapelle is of considerable importance. Its principal industry is wool-spinning and the manufacture of cloth, which is exported to all parts of the world. There are also important manufactures of needles, glass buttons, knives, umbrellas, soap, cement, bells, pottery, and crockery. Aix-la-Chapelle is advantageously situated as a commercial centre, being on the Prussian State Railway and on the line to Antwerp. Local traffic facilities are afforded by electric street railway lines within the city, connecting it also with many of the neighboring towns. The hot sulphur springs of Aix-la-Chapelle are celebrated for their curative properties in rheumatism and gout. They are frequented yearly by about 20,000 visitors. The principal spring is the Kaiserquelle, with a temperature of 136° F. In 1890 the population of Aix-la-Chapelle was over 103,000; in 1900, 135,235; in 1905, 144,095; in 1910, 156,143.

Aix-la-Chapelle was called *Aquisgranum* by the Romans, who frequented the place on account of its warm springs. Under the Frankish emperors it enjoyed great prosperity. Pepin erected here in 765 a palace in which probably Charlemagne was born. The latter made the city his home and lavished favors upon it. From the coronation of Louis the Pious in 813 until that of Ferdinand I in 1531, the German kings were crowned in Aix-la-Chapelle, and 17 imperial diets assembled there. Prior to the Reformation Aix-la-Chapelle was one of the most flourishing of the free imperial cities of Germany. The removal of the coronations to Frankfurt-on-the-Main (beginning with that of Maximilian II in 1562) marked the end of a city's splendor, while the religious troubles of the sixteenth and seventeenth centuries and a disastrous fire in 1656 hastened its decline. In 1793 it was taken by the French, but was ceded to Prussia in 1815. Consult: Stübgen, "Aachens Bebauungsplan und Bauliche Zukunft," in the *Deutsche Bauzeitung* (Berlin, 1880); Drapeyron, "Aix-la-Chapelle et Charlemagne," in the *Revue de Géographie*, vols. xlv, xlvi (Paris, 1899); "Re-

formationsgeschichte Aachens," in the *Historische Politische Blätter*, vol. cxxviii (Munich, 1901).

Treaties of Peace, and Congress of Aix-la-Chapelle. The first peace of Aix-la-Chapelle ended the war carried on between France and Spain for the possession of the Spanish Netherlands, known as the War of Devolution. On the death of Philip IV Louis XIV laid claim to a large portion of those territories in the name of his wife, Maria Theresa, the daughter of Philip, urging the law of succession prevailing in Brabant and Namur respecting private property. The victorious progress of Louis was checked by the triple alliance between England, Holland, and Sweden, and a treaty of peace was concluded at Aix-la-Chapelle, May 2, 1668, by which France retained possession of the fortresses of Charleroi and Lille, which she had already taken, but gave back Franche Comté to Spain.

The second peace of Aix-la-Chapelle concluded the War of the Austrian Succession (Oct. 18, 1748). (See SUCCESSION, WARS OF.) In general the possessions of the several States remained as before the war. Austria ceded Parma, Piacenza, and Guastalla to the Spanish infante, Philip; and the possession of Silesia and Glatz was guaranteed to Prussia. The privilege of the Assiento Treaty (q.v.) was confirmed to Great Britain for four years, and the pretender was expelled from France. Owing chiefly to the exertions of her minister, Kaunitz, Austria came off with but small sacrifice and obtained a ratification of the Pragmatic Sanction (q.v.) from the signatory powers.

The Congress of Aix-la-Chapelle was held in 1818, for regulating the affairs of Europe after the Napoleonic wars. The emperors Alexander I of Russia and Francis I of Austria and King Frederick William III of Prussia were personally present. The plenipotentiaries were Metternich, Castlereagh, and Wellington, Hardenberg and Bernstorff, Nesselrode, and Capo d'Istrias, with Richelieu on the part of France. France was admitted to take part in the deliberations as one of the five great powers of Europe, who proceeded thereupon to sign a protocol announcing a policy known as that of the "Holy Alliance" (q.v.). An important result of the Congress achieved by Richelieu was the immediate evacuation of France by the foreign forces. Consult De Broglie, *La paix d'Aix-la-Chapelle* (Paris, 1892).

AIZANI, ī-zā'nī, or **AZANI**, ā-zā'nī. A city in Phrygia, near Bithynia. In 1824 its remains were found by the Earl of Ashburnham, about 30 miles southwest of Kutaieh. There were a temple of Zeus, a theatre, a stadium, and a gymnasium. The theatre is in good preservation, with a diameter of 185 feet; it had 15 rows of marble seats. The Rhyndacus (now Adranus) rises near the site of Azani and passes through it; it was crossed by two white marble bridges, each of five semicircular arches. Tombs, Roman coins, and inscriptions have been found. The city is mentioned by Strabo.

AJACCIO, ā-yāt'chō. The capital of the French department of Corsica, comprising the whole of the island (Map: Southern France, Corsica, L 7). It is a seaport with a well-sheltered harbor and stands on the west coast, in a fertile belt of land known as Campo d'Oro. Its cathedral dates from 1585. Napoleon was born in Ajaccio, Aug. 15, 1769, and the house is still standing. A marble statue of the First Consul is seen in

the main square. Pozzo di Borgo was also a native of Corsica. The chief industries are the anchovy and pearl fisheries and shipbuilding, and trade in excellent wine and olive-oil, which the region produces in abundance. The harbor is protected by a strong fort. Pop., 1901, 21,779; 1906, 22,264; 1911, 19,227. Consult O. Joanne, *Ajaccio et ses environs* (Paris, 1899).

AJALON, āj'ā-lōn, or **AIJALON**, ā'jā-lōn (R. V.). A town in ancient Palestine, 14 miles northwest of Jerusalem, where Joshua is said to have commanded the moon to stay its course till he had finished his battle (Josh. x. 12). It belonged to the territory allotted to Dan (Josh. xix. 42), but this tribe could not keep it from the Amorites, who held it in the pre-monarchical period (Judges i. 35). Rehoboam fortified it (2 Chron. xi. 10), but in Asa's days it passed into the hands of the Philistines (2 Chron. xxviii. 18). It is mentioned in the Amarna letters (fourteenth century B.C.) under the form Aialuna. The modern village of Yalo represents the ancient site.

AJAWA, ā-jā'wā. A Bantu tribe of Portuguese East Africa, described by Livingstone. They have acquired some culture from contact with the Arabs. Cannibalism still exists among them, and at the funeral of a chief women are sacrificed; though they are accounted intelligent, industrious, and enterprising, a manly and independent tribe of blacks superior to others in this region.

A'JAX (Lat. form of the Gk. *Aías*, *Aias*). The name of two of the Greek heroes of the Trojan War. One of them was called Ajax the Less, or the Locrian, being the son of Oileus, King of the Locrians. At the head of 40 Locrian ships he sailed against Troy and was one of the bravest of the Greek heroes; in swiftness of foot he excelled all except Achilles. When Cassandra fled to the temple of Athena, after the taking of Troy, it is said that Ajax tore her from it by force and dragged her away captive. Others make him even violate the prophetess in the temple. Though he exculpated himself by an oath when accused of this crime by Ulysses, he did not escape the vengeance of the goddess, who caused him to be engulfed in the waves on his voyage toward Greece.

The other Ajax, called by the Greeks the Greater, was the son of Telamon, King of Salamis, and grandson of Æacus. He sailed against Troy with 12 ships, and is represented by Homer as, next to Achilles, the bravest and the handsomest of the Greeks. After the death of Achilles, Ajax and Ulysses contended for the arms of Achilles; and when the prize was adjudged by the Greek chieftains to Ulysses, Ajax in a fit of insanity slew the Grecian flocks, fancying he was slaying his enemies. On recovering his reason he threw himself on his sword. Sophocles, in the tragedy of *Ajax* (well edited by Jebb, Cambridge, 1896), attributes his madness to the intervention of Athena, champion of the Greek host. See TROJAN WAR.

AJMERE, āj-mēr'. An ancient city of Rajputana, India, the capital of the British province of Ajmere-Merwara, 228 miles west of Agra (Map: India, B 3). It is situated in a picturesque and rocky valley at the foot of the mountain of Taragurh, on whose summit there is a fort commanding the city. Another means of defense is an encircling stone wall, which has five lofty and handsome gateways on the west

and north. Most of the streets are narrow and dirty, but some of them are spacious and contain fine residences, besides mosques and temples of massive architecture. The Daulat Bagh, or 'Garden of Splendor,' is now the residence of the British commissioner of the province. The tomb of the Mussulman saint, Kwajah, within the town, is held in great veneration, and pilgrimages are made to it even by Hindus. In October a great annual fair is held in honor of the saint, at which presumed miracles are wrought. The Emperor Akbar journeyed to it from Agra on foot in 1570, in fulfillment of a vow before the birth of his son, Jehangir. Ajmere has manufactures of oil, cotton cloths, celebrated dyeing establishments, and a trade in opium and salt. It is the seat of Ajmere College and of Mayo College, an institution opened in 1875 for the instruction of the Rajputana nobility. The Anasagar, a large artificial lake to the north of the city, supplies it with water. Ajmere dates from about 145 A.D. It came under British rule by purchase in 1818. Pop., 1891, 68,800; 1901, 73,839; 1911, 86,222.

AJMERE-MERWARA, -mâr-wä'ra. A province of British India. It is situated in Rajputana, between 25° 30' and 26° 45' N. lat. and between 73° 53' and 75° 22' E. long. (Map: India, B 3). It occupies an area of 2711 square miles. Its location on the arid eastern slopes of the Aravalli Range (q.v.) and within the zone of uncertain rainfall renders it ill suited to agriculture and makes it subject to famine, the two in the last decade of the nineteenth century being especially severe. By irrigation it has been brought to some degree of productivity, and it yields cotton, wheat, and other food grains, and oil seeds. Iron and a few other metals are found in small quantities. Pop., 1891, 542,358; 1901, 476,912; 1911, 501,395. The inhabitants are mostly Hindus, the number of Mohammedans being about 81,000, and of Jains, 20,300. The Christians number 5400. The capital is Ajmere (q.v.).

AKABAH, ä'kä-bä. A town 2½ miles from the head of the Gulf of Akabah. Its exact location is 29° 30' N., 35° E. (Map: Asia, C 6). The ancient name was Aila, Aelana, or Elath (q.v.). Ahmed ibn Tulun (see TULUNIDS) built a new road across the mountain north of the gulf, which was called Akabat Aila; hence the name Akabah gradually took the place of Aila. The town was conquered by Baldwin I in 1116, taken by Saladin in 1171, and recaptured by Rainaud de Chatillon (q.v.), Lord of Montreal (Shobek) in 1181. It soon returned to the Ayyubid rulers and remained a port of the province of Kerak during the Mamluk period. To-day it belongs to Hejaz (q.v.). Strategically it has always been an important point; and its fortress has been a protection to the pilgrims going to Mecca. In 1841 it was recognized by Turkey as part of Egypt, but in 1892 Turkey resumed possession of it. Early in 1906 the Turks occupied Taba 8 miles south of Akabah (see EZION GEBER), but retired at the request of Great Britain, and a commission determined the boundary line so as to give Akabah to Turkey but include Taba within Egyptian territory. There is telegraphic connection with Maan-Damascus, and a branch line goes from Akabah to the Mecca railroad since 1906. See Musil, *Arabia Petraea*, vol. ii, 1907, p. 256, and article "Aila" in *Enzyklopädie des Islam* (1909).

AKABAH, GULF OF. (Ancient Sinus Ælaniticus.) The eastern of two inlets on the north end of the Red Sea, separating the Sinaitic peninsula from Arabia proper. It is about 100 miles long and 12 to 17 miles wide and forms part of the great rift valley, or structural depression, which extends from the Jordan River-Dead Sea depression in Palestine to Lake Tanganyika and Nyassa in Africa. At its head lies the port of Akabah.

AKAKIA, ä'kä'kê-ä', LE DOCTEUR. The name of a noted French physician of the sixteenth century (Martin Akakia, Grecized from the French name *sans-malice*), borrowed as a pseudonym by Voltaire in his *Diatribes du Docteur Akakia*. This was a brilliant satire, covering with ridicule Maupertuis and the Berlin Academy, of which he was president. King Frederick II, however, had it publicly burned (1752).

AKAMAGASEKI, ä'kä-mä'gä-sä'kê. See SHIMONOSEKI.

AKASHI, ä'kä-shê'. A town of Japan, in the prefecture of Hiogo, situated on the northern coast of the Inland Sea, and giving its name to the passage between Honshiu and the island of Awaji (Map: Japan, D 6). It is a station on the Sanyo Railway, and it lies 12 miles east of Kobé. The district is famous throughout Japan for its scenery, and it is a popular resort. The town contains a Shinto temple in honor of the ancient poet Kaki-no-moto-no-Hitomaro, and the remains of a moat and a large castle. Its meridian is used for the standard time of Japan. Pop., 1898, 21,196.

AKBAR, äk'bër; *Hind. pron.* ük'bër (Ar. very great), properly JALAL-UD-DIN MUHAMMAD (1542-1605). Emperor of Hindustan, the greatest Asiatic monarch of modern times. His father, Humayun, was deprived of the throne of Delhi by usurpers and fled to Persia. On the way thither, in the town of Amerkote, Akbar was born in 1542. Humayun recovered the throne of Delhi in 1555, after an exile of 12 years, but died within a year. The prince of 14 at first committed the administration to Bahram Khan as regent minister, but finding this authority degenerating into tyranny, he shook it off by a bold stroke and took the power into his own hands (1560). At this time only a few of the many provinces once subdued by the Mongol invaders were actually subject to the throne of Delhi; in 10 or 12 years (1568-76) Akbar's empire embraced the whole of Hindustan north of the Deccan, aided by Abu-l-Fazl. The wisdom, vigor, and humanity with which he organized and administered his vast dominions are unexampled in the East. He promoted commerce by constructing roads, establishing a uniform system of weights and measures and a vigorous police. He exercised the utmost vigilance over his viceroys of provinces and other officers, to see that no extortion was practiced and that justice was impartially administered to all classes of his subjects. For the adjustment of taxation, the lands were accurately measured, and statistics were taken, not only of the population, but of the resources of each province. He also forbade child-marriage, permitted the remarriage of widows, and endeavored to stop the practice of suttee. In politics, however, his main endeavor was to fuse the Mussulmans and the Brahmins. In religion Akbar was exceedingly liberal, largely on account of the influence of the vizier Abu-l-Fazl. He was fond of inquiries as to religious beliefs

and invited Portuguese missionaries from Goa to his court to give an account of the Christian faith. Literature received the greatest encouragement. Schools were established for the education of both Hindus and Mohammedans; and numbers of Hindu works were translated from Sanskrit into Persian. Abu-l Fazl (q.v.), the able minister of Akbar, has left a valuable history of his master's reign, entitled *Akbar Nāmah* ('History of Akbar'); the third volume, containing a description of Akbar's empire, derived from the statistical inquiries above mentioned, and entitled *Ayīn-i-Akbarī* ('Institutes of Akbar'), has been translated into English by Gladwin (3 vols., Calcutta, 1786, and London, 1800), and by Blochmann and Jarett (3 vols., Calcutta, 1873-94). Akbar's latter days were embittered by the death of two of his sons from dissipation and by the rebellious conduct of the third, Selim (known as Jehangir), who succeeded his father in 1605 and was suspected of being the cause of his death. Consult Malleson, *Akbar, Rulers of India Series* (Oxford, 1891-1901); Garbe, *Kaiser Akbar von Indien* (1909); id., "Akbar, Emperor of India," in the *Monist*, vol. xix (Chicago, 1909), and Modi, *Parsees at the Court of Akbar* (1903). See INDIA.

AKED, CHARLES FREDERICK (1864—). An Anglo-American clergyman and writer, born and educated at Nottingham. After acting for several years as auctioneer to the sheriff of Derbyshire, he decided to prepare for the ministry and entered the Midland Baptist College. In his earlier pastorates at Syston (1886) and St. Helen's and Earlestown (1888), he became locally known as an able preacher, but his reputation as one of the most eloquent public speakers in the United Kingdom was gained during his service at Pembroke Chapel, Liverpool. Under his ministry, beginning in 1890, this parish became one of the largest in England. As one of the founders of the "Passive Resistance League," designed to oppose the Boer War, Dr. Aked was for a time very unpopular in England. He became widely known as a lecturer, especially in the United States, which he had visited many times before accepting, in 1907, a call to the pastorate of the Fifth Avenue Baptist Church. While his pastorate in New York cannot be said to have been unsuccessful, he found conditions so uncongenial as to induce him to remove to San Francisco in 1911 to become pastor of the First Congregational Church. He became an American citizen in 1913. The degree of D.D. was conferred upon him by Brown University (1907). Besides numerous pamphlets on religious and social subjects, his published writings include *Changing Creeds and Social Struggles; The Courage of the Coward* (1905); *A Ministry of Reconciliation* (1907); *Mercies New Every Morning* (1907); *Wells and Palm Trees* (1908); *Old Events and Modern Meanings* (1908); *The Lord's Prayer: Its Meaning and Message for To-day* (1910).

AKEE, ā-kē' (native name, its scientific name being *Blighia sapida*). A fruit tree of the family Sapindaceæ, a native of tropical Africa, introduced into Jamaica in the latter part of the seventeenth century. It grows to a height of 25 feet or more, with numerous branches and alternate pinnate leaves resembling those of the ash. The flowers are small, white, on axillary racemes; the fruit is about the size of a goose's egg, with three cells and three seeds, and its

succulent aril has a grateful subacid flavor. The fruit is little inferior to a nectarine. Boiled down with sugar and cinnamon, it is used as a remedy for diarrhœa. The distilled water of the flowers is used by negro women as a cosmetic. The akee sometimes produces fruit in hothouses in Great Britain. In order to obtain this the roots should be cramped in pots. The Aki of New Zealand is a totally different plant, *Metrosideros buxifolia*, of the family Myrtaceæ.

AKEL'DAMA. See ACELDAMA.

À KEM'PIS, THOMAS. See KEMPIS, THOMAS.

AKENE'. See ACHENE.

A'KENSIDE, MARK (1721-70). An English author of considerable celebrity in his own day, on account of his didactic poem, the *Pleasures of the Imagination*, and some medical works. He was born at Newcastle-on-Tyne, where his father was a butcher. Being intended for the Presbyterian church, he was sent to study theology at Edinburgh, but soon abandoned it for medicine. He graduated as a physician at Leyden in 1744, and practiced at Northampton, then at Hampstead, and finally in London. His success as a practicing physician was never very great, owing, it is said, to his haughty and pedantic manner. He died in London, soon after being appointed one of the physicians to the Queen. At Leyden he had formed an intimacy with Jeremiah Dyson, and this rich and generous friend allowed him £300 a year. Some of his medical treatises, as that on dysentery, won for him distinction as a specialist. His later poetry, consisting chiefly of odes and hymns, did not attain the same reputation as his *Pleasures of the Imagination*, which was completed in his twenty-third year. In *Peregrine Pickle*, Smollett satirically sketched the character of Akenside under that of the pedant who undertakes to give an entertainment after the manner of the ancients. Akenside, who practiced blank verse and the Spenserian stanza, was one of the pioneers among the romantic poets. He became dissatisfied with his juvenile production and before his death had written a portion of a new poem on the same subject. Both poems were published in the complete edition of his works in 1772. For his biography consult Bucke (London, 1832) and Dyce (London, 1866); and also Beers, *English Romanticism in the Eighteenth Century* (New York, 1899).

AKERBLAD, ä'kēr-blād, JOHANN DAVID (1763-1819). A Swedish Orientalist and learned epigraphist. He was secretary of the Swedish embassy to Constantinople, whence he went to Jerusalem and the Troad in 1792-97. Later (1800) he was chargé d'affaires at Paris, but spent his last years in Rome. He published *Inscriptionis Phœniciaë Oxoniensis Nova Interpretatio* (1802) and *Lettre sur l'inscription égyptienne de Rosette* (1802).

AKERS, ā'kērz, BENJAMIN (PAUL) (1825-61). An American sculptor. He was born in Sacarappa, Me., July 10, 1825, and died at Philadelphia, Pa., May 21, 1861. While in his father's sawmill he made toys and turned his original designs into ornamental woodwork. He tried to be a printer, then essayed to paint, but later turned to sculpture, and studied plaster-casting with Thomas Carew of Boston. In 1850 he opened an atelier in Portland, Me., with the painter Tilton. Among his early works are busts of Longfellow and other celebrities, the proceeds from which enabled him to pass a year in study at Florence. On his return he

modeled busts of President Pierce, Edward Everett, Sam Houston, and other celebrities at Washington. In 1855 he opened an atelier at Rome, where he became the centre of American art circles. Hawthorne refers to his colossal bust of "Milton" and "Pearl-Diver" in the *Marble Faun*; and it is said that the character of Kenyon in that book is drawn from the personality of the young sculptor. At Rome he carved his "Una and the Lion," "Girl Pressing Grapes," "Isaiah," and other works. He remained in Europe until, in 1860, failing health drove him home for a last vain endeavor to recover his strength. His character was singularly attractive and pure. His art, like other classicist sculpture of the period, lacks power and virility.

AKERS, ELIZABETH CHASE ALLEN. See ALLEN, ELIZABETH CHASE.

A'KERSHEM, Miss SOPHRONIA. An unlovely character in Dickens's *Our Mutual Friend*. She becomes the wife of Albert Lamble (q.v.).

AKHALTSIKH, ä'käl-tsëk'. The chief town of a district in the government of Tiflis, Russian Armenia, about 95 miles west of Tiflis, and 1450 miles by rail southeast of Moscow, on the banks of the Poskhov-Tchai, an affluent of the Kur (Map: Russia, F 6). It is situated in a valley of the Keldir Mountains, 3376 feet above sea level. The river running through it divides the town into the old town and citadel, on the left bank, and the new town on the right. It is well protected by a fortress built upon an almost inaccessible height. The climate is salubrious, although the winters are very severe and the summers exceedingly hot. The surrounding scenery presents a view of wild, rugged beauty, enhanced by the numerous gardens encircling the town. The mosque of Sultan Ahmed, built on the model of St. Sophia in Constantinople, has a library attached to it which was considered to be one of the most valuable in the East. The Russians carried off a great part of its most valuable treasures to St. Petersburg. The manufacture of small arms and weapons and silver filigree work is carried on in the town, and an active trade with various places on the Black Sea is maintained. Coal is mined in the vicinity. About 16 miles to the northwest of the town are the well-known Abas-Tumansk mineral springs. Deposits of lignite are found in the neighborhood. Akhaltsikh was anciently called Keldir, or Chaldir. Once a considerable mart for trading in Christian slaves, it has, since its occupation by Russia, become a Christian town. Eighty per cent of its population are Armenians and 10 per cent Jews. It is the seat of an archbishopric of the Greek church. In 1828, when the Russians took possession of it, it had a population of 50,000, but it has decreased since, so that at the time of the taking of the last census, in 1897, there were only 15,300 inhabitants.

AKHISSAR, äk'hīs-sär' (anciently Lat. *Thyattira*, Gk. *Θυάτειρα*, *Thyateira*). A town in the Turkish vilayet of Smyrna, Asiatic Turkey, situated 52 miles northeast of Smyrna, on somewhat elevated ground in the valley of the Hyllus (Map: Turkey in Asia, B 3). The streets are paved with carved stone, and other relics of antiquity abound, but there are no ruins of ancient buildings. Cotton goods are exported, but the town is celebrated for its dyes. The town is situated on the Monissa-

Soma Railway. Its population is estimated at from 12,000 to 22,750.

AKHMIM, äk-mēm', or **EKHMIM, ëk-mēm'.** A city of some 10,000 inhabitants, on the right bank of the Nile, in Upper Egypt (Map: Egypt, E 6). It occupies the site of the ancient Chemmis, or Panopolis, the seat of worship of the harvest god Min, an ithyphallic deity whom the Greeks identified with Pan. In Christian times the city became an important religious centre, and many converts congregated in the vicinity. Nestorius, patriarch of Constantinople, whose heresy was condemned by the Council of Ephesus, 431, died in banishment at Panopolis.

AKHTAL, äk-täl', GHIYATH B. SALT B. TARIKA AL. A Christian Arabic poet, born in Hira about 640 A.D. His mother, Laila, belonged to the Christian tribe Yad. He proudly refused to change his faith, as others did, "from hunger rather than from conviction." His religion possibly shows its influence in his comparative freedom from obscene language; it allowed him to indulge his appetite for wine as a protest against the Moslem prohibition and as a means of gaining inspiration. He was a court poet to the Umayyad rulers in Damascus. If he had not been a Christian, he would no doubt have been regarded as the greatest poet of the Umayyad period; even with this serious drawback he is by general consent accorded a place with Jarir and Farazdak. He died about 710 A.D. See H. Lammens, *Le chantre des Omiades: notes biographiques et littéraires sur le poète arabe chétien Ahtal* (Paris, 1895).

AKHTYRKA, äk-tir'ká. A town of European Russia, in the government of Kharkov, 72 miles northwest of Kharkov and 520 miles south of Moscow (Map: Russia, D 4). It is situated on a small river of the same name, an affluent of the Dnieper, in a rather low valley which is subject to frequent inundation so that at times communication becomes very difficult. It has a lively trade with the great pilgrim crowds attracted there by the famous Akhtyr image of the Holy Virgin which is kept in the cathedral, and by the Trinity cloister, situated on the outskirts of the town. Some manufacturing is carried on in textiles and boots and shoes, and a great annual fair is held. A considerable commerce is also carried on in grain and cattle. The surrounding country is fertile, and excellent fruit is grown. The town was founded by the Poles in 1641 and acquired by the Russians in 1647. Pop., 1912, about 25,000.

AKHUND OF SWAT, ä-kōōnd', swät, THE (1794-1874). A Mohammedan saint, who exercised great influence and had almost unquestioned authority over Mohammedans all over Central Asia. His residence in the mountainous country of Swat, on the borders of India and Afghanistan, was the resort of numerous pilgrimages to consult him on questions of every kind. For half a century the English government assiduously watched this man, who possessed a power which no other person in Asia could pretend to wield; but the Akhund generally kept on friendly terms with the English.

AKIB, ä'këb', LE RABBIN. The pseudonym under which Voltaire published, in 1761, his *Sermon du Rabbin Akib—traduit de l'Hébreu*.

AKIBA BEN JOSEPH, ä-kë'bä bën jō'zëf. A famous rabbi and head of a rabbinical school at Bene-Barak, near Jaffa, and later at Ziphron, modern Zafron, near Hamath. He was born

c.50 A.D. and died as a martyr probably in 132 A.D. Although he began the study of the law at a comparatively advanced age, after having bitterly opposed the rabbis for years, he rose to a prominent position among the rabbis of his day by virtue of his learning and acumen, and many are the stories and legends told about his early struggles and final success. He seems to have been in Rome in 95 or 96 A.D. and made a visit to Nehardea in Mesopotamia sometime before 110 A.D. Akiba laid the basis of the "Mishna" by beginning the systematization of Jewish oral law, and his collection became known as the Mishna of Rabbi Akiba. His influence as a teacher upon the founders of the Mishna was also very great, and it was he likewise who, to a large degree, advanced the peculiar biblical exegesis which is a characteristic feature of Talmudic literature. His scholarship did not weaken Akiba's interest in the political affairs of the day. How far he was personally active in the great Jewish revolt against Rome in Hadrian's time cannot be determined. But it is certain that he saw in Bar Kokba (q.v.), or Bar Kozeba, the promised Messiah and applied to him the title 'son of the star' (Palestinian Talmud, Taanith iv, 68d). Legends gathered around the career of Akiba. He was put to death on account of his transgressing Hadrian's edicts against the practice and teaching of the Jewish religion, after several years of imprisonment, and bore the tortures to which he was subjected with great fortitude. His grave, shown at Tiberias, became a place of devout pilgrimage.

A-KIKUYU. See KIKUYU.

AKITA, ä'kê-tä, or **KUBOTA,** kōō'bō-tä. A town of Japan, the capital of the prefecture of the same name, situated on the western coast of Honshiu, near the Hachiro Lagoon, and on the right bank near the mouth of the Toshimagawa River (Map: Japan, G 4). It carries on a considerable trade in rice with Hakodate and has some manufactures of silk cloth and cotton crape. Pop., 1903, 34,350; 1908, 36,294. The prefecture of Akita is rich in minerals and woodland. Cattle raising, mining, and the manufacture of cloth are the principal industries. Its area is 4500 square miles, and in 1903 it had a population of 834,779.

AKKA, äk'kä. A pygmy tribe or race, now living within the confines of the Belgian Congo, with the Mangbetu (Monbuttu). Their discovery by Schweinfurth for the first time definitely established the stories of African pygmies by classical writers of antiquity, Du Chaillu's accounts having been set aside as too sensational to be believed. In height, the Akka average about 4 feet 6 inches; color, yellow brown; features, negroid. They are extremely retiring and do not mix with neighboring tribes, though usually they live near, and are under the protection of, the tall negroes. Their houses are dome-shaped, arranged in a circle, with the communal cooking fire in the centre. Though dwarfs in stature, they do not hesitate to attack large game with poisoned arrows, the python being their favorite quarry. Their food is principally nuts and berries. The Akka tribe presents a difficult ethnological problem, next to nothing being known of their language and customs. Consult: Schweinfurth, *Heart of Africa* (London, 1873); Deniker, *Races of Man* (London, 1900).

AKKAD, äk'käd or äk'käd. See ACCAD.

AKKERMAN, äk'ker-män'. Formerly a fortress, now the chief town of a district in the government of Bessarabia, Russia, at the mouth of the Dneister, 12 miles from the Black Sea and about 30 miles from Odessa (Map: Russia, D 5). The chief industry of the town is the raising of fruits, especially of grapes, there being no less than 2000 gardens within the city proper, besides numerous other beautiful ones which surround the town. An annual fair is held here during the month of December. The harbor is accessible to large steamers, and the town has regular steamship communication with Odessa, to which it exports fish, wools, wines, and salt, which is procured from lakes and marshes in the vicinity. Akkerman is the site of an ancient Roman town, possibly Alba Julia, which was destroyed and later rebuilt. Pop., 33,000.

AKKESHI, ä'kê-shē, or **AKISHI,** ä'kê-shē. A town of Japan, situated on the southern coast of Yezo, on the Akkeshi Bay (Map: Japan, J 2). It is famous for productive oyster beds and contains an oyster-canning establishment.

AK'KRA, or **AC'CRA.** The chief town of the district of the same name, in the British West African colony of the Gold Coast (Map: Africa, D 4). It has a salubrious climate, being separated from the interior of the colony by mountain chains. The number of Europeans is comparatively small, but the town bears strong marks of European influence. A railroad line connecting Akkra with Mangoase, 40 miles distant, is under construction. There are several churches, a bank, a club house, a number of European shops, and a government school for primary education, to which is attached a school of carpentry and woodwork. Pop., 1901, 14,842; 1911, 19,585.

AKMOLINSK, äk'mō-lyënsk'. A province of the General Government of the Steppe in Russian Central Asia. It extends from the Trans-Siberian Railroad in the north (55° N. lat.) to the Chu River in the south (45° N.). The northern and southern parts of the province are arid steppes mainly with interior basin drainage, i.e., water-courses having no outlet but ending in salt lakes. To these belong the Sary-Su and Chu rivers in the southern part, which is known as the Bekpak-Dala, or 'Hunger Steppe.' The central section is hilly and has deposits of copper, anthracite coal, and some gold; here lives the greater part of the sedentary population. The principal industries of Akmolinsk are the growing of flax and tobacco, cattle raising, fishing, and, in some localities, hunting. The deposits of coal, iron, copper, and the precious metals, have been but little developed. Area, 218,478 square miles. Pop., 1887, 463,400; 1911, 1,064,000, of which about half are nomadic Kirghiz. The capital is Akmolinsk, with about 10,000 inhabitants. It lies near the head of the Ishim River and is a great caravan centre, the most extensive trade being with Tashkiut and Bokhara. The most important town is Omsk.

AKOI'METOI. See ACÆMETÆ.

AK'RAGAS (Gk. 'Ακράγας). The ancient Greek name of the Sicilian city Girgenti. See AGRIGENTUM.

AKRI. See ACTIUM.

AK'RON. A manufacturing city, railroad centre, and the county-seat of Summit Co., Ohio. It is 35 miles south of Cleveland, on the Ohio Canal, and the Erie, the Baltimore and Ohio, the Pennsylvania, the Northern Ohio,

and the Akron, Canton and Youngstown railroads. The city is surrounded by a chain of lakes where hotels and amusement places have been established. Akron is now the largest rubber-manufacturing centre in the world, and the other industries of the city are of great variety. Among these are printing and lithographing, and the manufacture of iron, steel, sewer pipes, pottery, agricultural implements, furnaces, automobiles, and fishing tackle. Founded in 1825, Akron was incorporated as a village in 1835 and as a city in 1865. The rubber industry was started in 1869 by Dr. B. F. Goodrich, and the growth of the automobile business has been responsible for its enormous development. The government is vested in a mayor, president of the council, boards of public service and public safety, treasurer, solicitor, and auditor, all elected for two years. The city council has 11 members, three of whom are elected at large. The board of health consists of five members appointed by the mayor and council. The city's annual income amounts to about \$900,000, of which about \$400,000 is appropriated for education. Other chief items of expense are: fire department, \$101,100; police department, \$68,500. Akron is the seat of Buchtel College, formerly under Universalist control but now non-sectarian. The city maintains a library, a hospital, and owns its water works. One of Akron's notable points of interest is Portage Path, an old Indian trail between the Cuyahoga and Tuscarawas rivers. This trail was at one time part of the western boundary of the United States. Pop., 1870, 10,000; 1890, 27,601; 1900, 42,728; 1910, 69,667. Consult S. A. Lane, *Fifty Years and Over of Akron and Summit County* (Akron, 1892), and *Akron Chamber of Commerce Year Book* (1913-14).

AKRON, UNIVERSITY OF. The **BUCHTEL COLLEGE.**

AKSAKOFF, äk-sä'kōf, IVAN SERGEYEVICH (1823-86). A Russian writer and leader of the Panslavists, born in the government of Ufa. He studied in the school of jurisprudence at St. Petersburg and graduated in 1842, afterward entering the Moscow division of the Senate. In 1848 he entered the service of the Ministry of the Interior. Four years later he became editor of the Moscow *Sbornik*, which was soon suppressed. In 1855-56, during the Crimean War, he was in Bessarabia in command of the Serpukhoff detachment of the Moscow levy. He established the *Den*, a weekly paper published from 1861 to 1865, and the *Moskva*, a daily paper, which was established in 1867. This latter sheet was suppressed three times by the government within 22 months, these suppressions aggregating 13 months of that period. As chairman of the Slavic Philanthropic Society, he worked incessantly in the interest of a united state of all the Slavic nations. During the Russo-Turkish War he became the recognized leader of all those influences that brought about the War of Liberation of the Balkan Slavs, and his speeches in support of this cause had a world-wide circulation. The Moscow Slavic Committee was suppressed as a result of Aksakoff's bitter attacks, whereupon Aksakoff was banished from Moscow, but was permitted to return soon after. From 1880 until his death he published the weekly *Rus* in the interests of the Slavophil party. In December, 1885, he made a bitter attack on Russian diplomacy in

Bulgaria, with the result that an official reprimand was issued against his paper. He was the best-known poet of the Slavophil cause. His complete works were published by his wife after his death. Consult A. N. Shtiglich, *Pamyate Ivana Sergyeevicha Aksakova* (St. Petersburg, 1907).

AKSAKOFF, SERGET TIMOFEYEVITCH (1791-1859). A Russian writer, born in the government of Ufa. Learning his letters at the age of four, he had read widely before he was 10, and was ready to enter the University of Kazan in 1804. On graduating from the university he entered the legislative commission at St. Petersburg, which he served for five years (1807-12). Beginning to write at the early age of 15, he led a busy literary life ever after. His works include the serio-humorous *Observations on Angling* (1847); *Memoirs of a Huntsman in the Government of Orenburg* (1852), with their continuation, *Tales and Memories of a Huntsman* (1855); and *The Family Chronicle* (1856), by some considered his best work, of which a second part appeared as *Bogrov's Childhood* (1858). A selection from his shorter writings was published in 1858.

AKSHEHR, äk-shě'h'r (Turk. White Town, ancient Gk. Φιλομήλιον, *Philomēlion*). A city in the Turkish vilayet of Konieh, Asia Minor, situated on the Scutari-Konieh border, south of the Lake of Akshehr, about 60 miles by rail from Afium-Kara-Hissar (Map: Turkey in Asia, D 3). It lies at the foot of the Sultan-Dagh in a fruitful and well-watered region, has a considerable trade, and manufactures carpets. Pop., about 15,000.

AKSU, äk-sōō'. A town of eastern Turkestan, situated in lat. 41° 7' N. and long. 81° E., 260 miles northeast of Yarkland, west of the river Aksu, at an altitude of over 3000 feet (Map: Asia, H 4). It is surrounded by a strong wall and is of considerable strategic importance. It is a meeting-place for the caravans from Russia, China, West Turkestan, Kashmir, and India. The inhabitants are engaged chiefly in the manufacture of metal ware, tobacco, and cotton and leather goods. Copper and lead deposits are near by. In 1716 Aksu was nearly destroyed by an earthquake. In 1867 it was taken by the Khan of Kashgar, but was recaptured by the Chinese in 1877. Its population is about 20,000.

AKYAB, äk-yäb'. A town of Burma, India, the chief seaport of the district of Akyab or Arakan proper, and the capital of the province of Arakan (Map: Asia, J 7). It is situated on the eastern side of the island of Akyab, at the mouth of the Kuladan River, in lat. 20° 7' N., 190 miles southeast of Calcutta. The houses are well built, the streets broad and regular, and it has a fine and well-protected harbor. The chief article of export is rice. The United States is represented by a consular agent. Its rise from a fishing village dates from its selection as a port and the capital of the province in 1826. Pop., 1901, 35,680; 1911, 37,893.

AL, ä'l. The article in the Arabic language. The pronunciation of the initial vowel is vague, so that the article vacillates between *al* and *el*. Before dentals, sibilants, and liquids, the *l* sound is assimilated to the following consonant, so that, e.g., *al-shams* ('the sun') becomes *ash-shams* in pronunciation, though *al* is still written and it is now customary to print it as well.

The initial vowel is frequently elided when the word preceding the vowel ends in a vowel, e.g., *Abu'l-Feda* for *Abu-al-Feda*. The Arabic article appears in such English words as algebra, alchemy, alcove, and Alhambra, which are directly derived from the Arabic.

ALA. In anatomy and biology any wing-like process or formation, e.g., the *ala nasi*, or lateral wing of the nostril; the *alæ* of the ethmoid bone; the alar ligaments of the knee. In botany, the side petals of a papilionaceous flower.

ALABAMA, ăl'ă-bă'mă or -băm'ă. A river formed by the junction of the Coosa and Tallapoosa rivers, about 10 miles north of Montgomery, Ala. (Map: Alabama, B 4). Its general course is westward to Selma, thence southwestward to about 50 miles north of Mobile, where it meets the Tombigbee, and with that stream forms the Mobile River. It is 320 miles long and navigable from its mouth to Montgomery, nearly its entire length.

ALABAMA, known as the "COTTON STATE." One of the Gulf States of the American Union, situated between lat. 30° 10' and 35° N., long. 84° 53' and 88° 30' W. It is bounded on the north by Tennessee, on the east by Georgia, on the south by Florida and the Gulf of Mexico, on the west by Mississippi; length, about 336 miles from north to south; average width, 175 miles; total area, 51,998 square miles, of which 719 square miles is water (Map: United States, J 4). Alabama, by the revised areas of 1910, ranks as the eighteenth State in the Union in population, the twenty-seventh in size, and ninth in order of admission.

Topography. The southern extremity of the Appalachian mountain system extends into the State from northern Georgia in a series of low parallel ranges. Of these, Raccoon and Lookout mountains are the most prominent, but do not attain any great elevation. They are flat-topped ridges, about 1600 feet in elevation at the Georgia line, gradually lowering to the westward, the Raccoon Mountains extending in a very low range (called Sand Mountains) well across the State, while Lookout Mountain terminates abruptly after reaching a distance of about 60 miles within the State. To the southeast of these ranges lies the comparatively level Piedmont region. To the southwest, at the very terminus of the mountain system, is the low-lying Cumberland plateau—the coal fields of Alabama. On the north of all these are the lower lands of the Tennessee valley. The whole region just described includes the northeast two-fifths of the State. The remainder, the southwest three-fifths of the State, constitutes the coastal plain, which slopes gradually from an elevation of about 600 feet to sea level.

Climate and Soil. Excepting in the lowland along the rivers, the climate is very healthful, particularly in the north. Extremes of temperature are rare, the mean temperature for January being 42.9° and for July 83.9°. The summer heat is tempered by winds from the gulf. Snow falls occasionally in January and February, but rarely in the south; the frost limits at Montgomery are October 10 and April 25. The prevailing winds for the whole year are from the south and southwest.

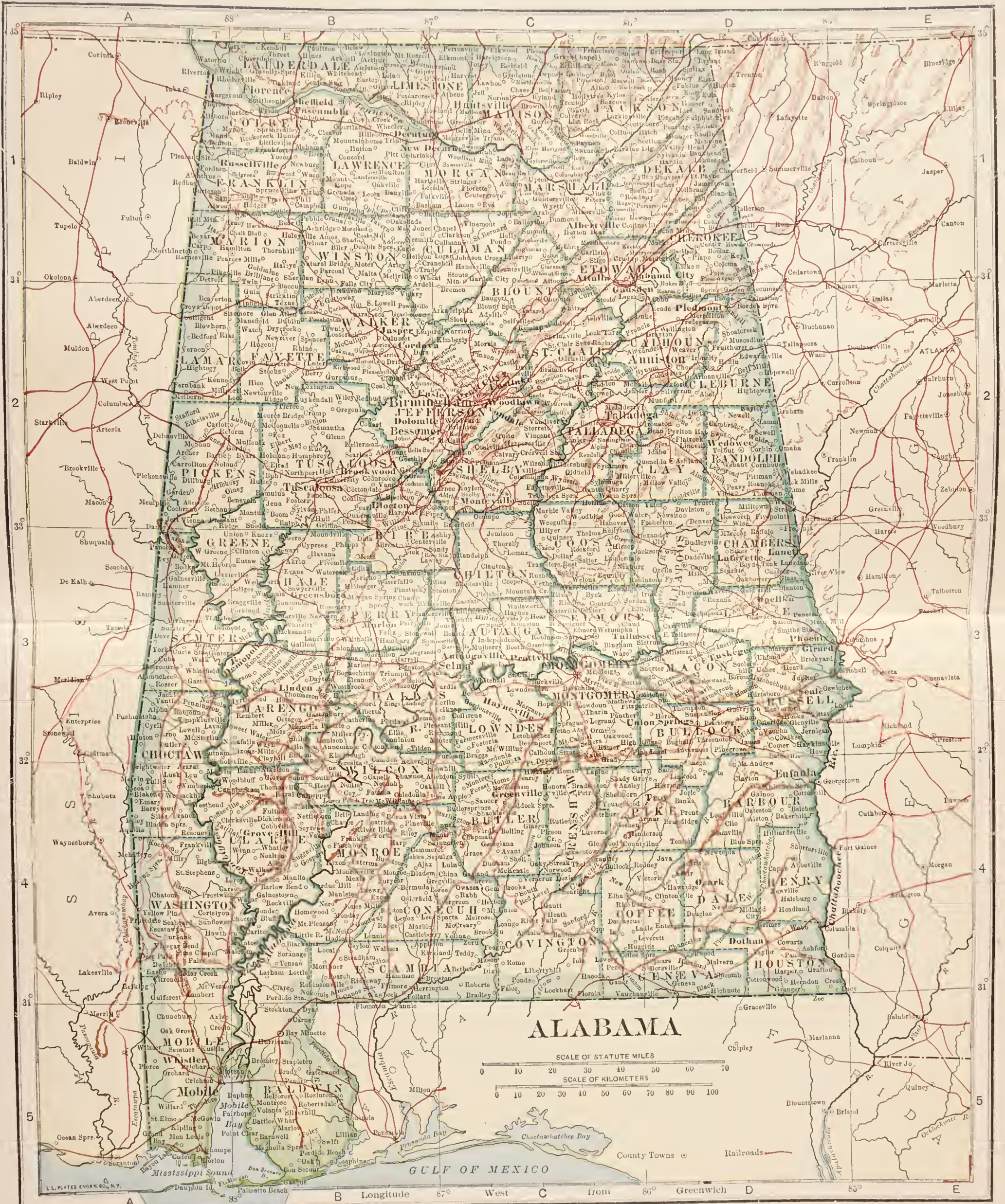
The average temperature and rainfall in the north are 59.70° and 54 inches respectively, gradually increasing to 66.60° and 63 inches in the south.

The valley of the Tennessee has chiefly a deep red calcareous soil, utilized for the cultivation of cereals; that in the metamorphic region is a red or gray loam with clay subsoil; in the coal regions it is sandy, with sand or clay subsoil; the north or middle divisions are bordered by a wide belt of red or yellow loam over stratified rocks and pebbles and are heavily wooded; the cotton belt has a heavy black calcareous soil from 2 to 20 feet deep, forming a portion of the so-called "black belt" of the Southern States. South of this, brown and red clay loams predominate. In the extreme southern countries the soil is light and sandy. Swamp land occupies considerable areas in various parts of the State.

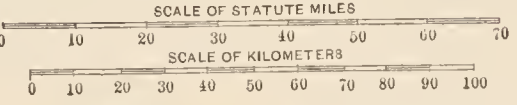
Geology. The stratified rocks represent every formation occurring in the Appalachian region. There are three geological divisions of Alabama, viz.: The northern, containing most of the State north and west of a line from the northeast corner of the State through Birmingham nearly to Tuscaloosa, and including the great Tennessee valley, in which the rock masses belong to the Sub-carboniferous limestones and the Coal measures; their strata are approximately horizontal. Adjoining this on the east is the middle region, bounded by a line drawn from Tuscaloosa through Centreville, Clanton, and Wetumpka to Columbus, Ga. This includes (1) the metamorphic region, with altered and crystalline sediments of Silurian or preceding ages—quartzites, marbles, granites, and gneisses; the strata in many places disintegrated into masses of stratified clay and interlaminated with quartz seams. (2) The Coosa valley, with prevailing calcareous rocks. (3) The Coosa and Cahaba coal fields, their strata consisting of sandstones, conglomerates, shales, and coal beds, tilted and unequally degraded. This division contains some of the highest land in the State. The southern division, south and west of these limits, including the cotton belts, consists largely of drift deposits irregularly stratified over the eroded surface of Cretaceous and Tertiary rocks. Clarke County, between the Alabama and Tombigbee, is rich in fossil remains of the Tertiary age.

Mineral Resources. The southern limit of the mineral region may be indicated by a line passing through Pikeville, Tuscaloosa, and Wetumpka to Columbus, Ga. Within this area are the comparatively insignificant gold deposits of Tallapoosa County, and three fields of bituminous coal over 8660 square miles in extent, named from the rivers that drain them—the Warrior, the Cahaba, and the Coosa. Cannel, free-burning, lump, coking, gas, and other coals of superior quality are found. There are extensive beds of iron ore, including red hematite, limonite, black-band, magnetic, and specular; and the Choccolocco, Anniston, Coosa, Cahaba, Birmingham, and other valleys are noted for the abundance of their iron ore. Among other mineral products are asbestos, asphalt, copper, corundum, emery, fire clay, graphite, granite, lithographic stone, manganese, white and variegated marble, marl, red ochre, phosphates, bauxite, pottery and porcelain clays, salt (in the southwest), slate, soapstone, and small amounts of silver and tin. Natural gas has also been discovered, but the supply is inconsiderable.

Mining.—The utilization of the mineral resources of Alabama is, perhaps, the most remarkable feature of the industrial progress of the South in the last decade. Though it was long known that there were vast quantities of



ALABAMA



L. L. PLATES ENGINE CO., N. Y.

A Longitude 87° West C from 86° Greenwich D 85° E

iron and coal in the State, it was not until a comparatively recent period that the mining of these minerals on a large scale was undertaken. Thus the value of the bituminous coal mined in the State in 1886 was but \$2,500,000. In 1900 it had risen to \$10,000,000, in 1905 to \$14,875,000, and in 1910 to nearly \$20,000,000. The increase in the iron-mining industry is quite as striking. In 1880, 171,000 long tons of iron were mined; in 1905 the production had increased to 4,257,000 tons, and the State ranked third in the production of iron ore.

These conditions are reflected in, and are chiefly responsible for, the great development of the manufacturing industries of the State. See *Manufactures*.

As indicated above, coal and iron constitute the chief mineral resources. The coal is bituminous, and a considerable portion of it is used in the manufacture of coke, in the production of which Alabama is surpassed in quantity only by Pennsylvania.

The statistics of the thirteenth census, which are for the calendar year 1909, show the following facts in regard to the mining of coal in the State. In that year there were 167 coal mines in Alabama; the capital invested was \$19,632,647; the production was 6,515,922 tons, valued at \$8,125,811, and the wage-earners employed numbered 20,914. In the manufacture of coke 2,396,543 tons of coal were used. Since 1909 the production of coal has showed a remarkable increase. In 1910, according to the figures of the United States Geological Survey, there were mined 15,018,965 tons, and in 1912, 16,100,600 tons. In the production of coke, as noted above, the State ranks second. The output in 1912 was 2,975,489 short tons, valued at \$8,098,412, compared with 2,761,521 tons, valued at \$7,593,594 in 1911.

To the remarkable increase in the production of the iron mines of the State is due the wonderful advance of Birmingham and other cities as industrial centres. The greater part of the iron mined is red hematite. The State ranks third in the amount of ore produced; it is surpassed only by Minnesota and Michigan. According to the thirteenth census, the value of the iron ore in 1909 was \$4,939,149, and the statistics of the Geological Survey show a production in that year of 4,321,252 tons. The marketed production in 1912 was 4,563,603 tons, valued at \$5,734,371. In 1909 there were 25 operators of iron mines, and the wage-earners employed in the mines numbered 5666. In the manufacture of pig iron Alabama ranks fourth. There were produced, in 1912, 1,987,753 tons, valued at \$21,371,053, compared with 1,617,150 tons, valued at \$17,379,171 in 1911. The pig iron output has decreased somewhat since 1905, as a result of industrial and other causes. In that year the output was valued at \$22,680,000. Other important mineral products of the State are limestone, bauxite, and graphite, which are mined in Cherokee County. Clay products, sandstone, and mineral waters also have a considerable value. Petroleum has been found in the western section of the Warrior coal fields, at Fayette; wells have been driven, but oil has not been produced in quantities sufficient to justify extensive exploitation of the field.

The total value of the mineral products of the State in 1909 was \$24,350,667. The wage-earners in the mines numbered 30,795, and the capital invested was \$85,081,804.

Fisheries. In 1908 the total value of the product of fisheries in Alabama was \$387,220. By far the most important branch of this industry is the oyster-fishing, and there were 536,300 pounds of oysters taken, valued at \$168,870. Other fisheries of some importance were red snappers, mullets, catfish, and shrimps. The number of independent fishermen was 787, with 61 boats.

Agriculture. Alabama, like most of the other Southern States, is preëminently agricultural. The soils suitable for cultivation are extremely varied. They range from dark, mucky loams along the immediate coast line, to sands, sandy loams, fine sandy loams, and heavy clay soils throughout the more inland regions.

During the decade 1900 to 1910 the increase in the number of farms slightly exceeded the increase in the population. There were, in the latter year, 262,901 farms, compared with 223,220 in 1900, or an increase of 17.8 per cent. The increase in the population in the same period was 16.9 per cent. (See *Population*, below.) Of the total land area of 32,818,500 acres the land in farms in 1910 comprised 20,732,312 acres, a gain of 46,885 acres in the decade. The farm lands improved in 1910 amounted to 9,693,581 acres. The average acres per farm in 1910 were 78.9 and in 1900 92.7.

The total value of farm property in the State in 1910 was \$370,138,429. This includes land, buildings, and live stock. The corresponding value in 1900 was \$179,399,882. This shows an increase of 106.3 per cent in the decade. The average value of all property per farm in 1910 was \$1408, and, in 1900, \$804. The average value of land per acre in 1910 was \$10.46 against \$4.84 in 1900, an increase of 116.1 per cent in the decade.

The tendency to lease farms to tenants or on shares, which is common in some Southern States, is characteristic of Alabama. Of the 262,901 farms in the State in 1910, 158,326 were operated by tenants, and 104,575 by owners or managers. That this tendency is increasing is shown by the fact that, while the total number of farm operators increased 93.5 per cent in the decade 1900-1910, the number of tenants increased 148.7 per cent. The arrangements of lease differ; of the total number in 1910, 67,352 were shareholders, 2428 share-cash tenants, and 83,300 cash tenants.

The relative amount of land cultivated by white and colored farmers in Alabama is of great interest. In 1910, out of a total of 20,732,312 acres in farms, 15,640,877 acres were owned or operated by white farmers, and 5,019,435 by colored farmers. It is significant that while the acreage owned or operated by white farmers decreased from 15,965,260 in 1900 to 15,640,877 in 1910, the acreage owned or operated by colored farmers increased from 4,720,167 in 1900 to 5,019,435 in 1910. The greater number of colored farmers cultivate the property as tenants. Colored owners in 1910 held 1,466,719 acres, while 3,607,234 acres were under tenancy. That negro ownership of farm lands is increasing, while ownership by white farmers is decreasing, is shown by the fact that white ownership in 1900 was 12,348,537 and, in 1910, 11,813,387, while colored ownership increased from 1,216,813 in 1900 to 1,466,719 acres in 1910. Of the 103,929 farms owned in 1910, 74,504 were free from mortgage, 27,457 were mortgaged, and the status of 1908 was unknown. The propor-

tion of farms free from mortgage decreased from 80.8 per cent in 1900 to 73.1 per cent in 1910.

The greater number of farms in the State, for both white and colored, average from 20 to 49 acres. Farms of this size comprise over two-fifths of the entire farm area in the State; one-fifth are from 50 to 99 acres, and about one-eighth from 100 to 174 acres. Thus more than three-fourths of the farms of the State are between 20 and 174 acres.

Of the farmers in Alabama in 1910, 152,458, or 58 per cent, were white, and 110,443 were non-white. Of the non-whites, all but 56 were negroes.

The total value of live stock on the farms of the State in 1910 was \$65,595,000. This includes domestic animals, poultry, and bees. The cattle numbered 932,428; horses, 135,636; mules, 247,146; swine, 1,266,733; sheep, 142,930, and goats, 79,347. The fowls of all kinds numbered 5,028,104. On Jan. 1, 1913, there were in the State 146,000 horses, 270,000 mules, 931,000 cattle, 132,000 sheep, and 1,146,000 swine.

The acreage, production, and value of the principal crops in 1909 and 1912 are given in the following table. The figures for 1909 are from the thirteenth census, and those for 1912 from the United States Department of Agriculture.

	ACREAGE		PROD. BU.	VALUE
Corn,	1912	3,150,000	54,180,000	\$44,120,000
	1909	2,884,824	34,072,032	30,927,210
Wheat,	1912	30,000	318,000	359,000
	1909	13,665	113,953	120,873
Oats,	1912	260,000	5,200,000	3,224,000
	1909	257,276	3,251,146	2,117,703
Potatoes,	1912	15,000	1,215,000	1,094,000
	1909	14,486	1,128,564	884,497
Hay,	1912	209,000	261,000 *	3,811,000
	1909	238,656	251,403	3,357,132
Tobacco,	1912	300	225,000 †	79,000
	1909	211	90,572	14,892
Cotton,	1912		1,330,000 ‡	
	1909		1,129,527	74,205,236

* tons † pounds ‡ bales of 500 pounds each

The value of the cotton crop in 1909 was over twice the aggregate value of all the other crops combined. The total acreage of the combined cereals was, in 1909, slightly more than three-fourths as great as that of cotton, and their value about two-fifths as great.

In addition to the crops noted above, the State produces others of value. The peanut crop in 1909 was valued at \$1,490,654. Sweet potatoes and yams were valued at \$3,578,710, and cottonseed at \$12,803,196. The growing of orchard fruits and small fruits is of considerable and increasing importance. The former, in 1909, were valued at \$1,818,508, and the latter at \$165,386. Of the orchard fruits, apples are of the greatest importance, and of the smaller fruits, strawberries. Figs, oranges, and grapefruit are grown, but of these only the first is important. The figs produced in 1909 were valued at \$80,960. The production was 1,773,126 pounds.

Forest Products. There were, in 1909, 107,985 farms which reported forest products. These include firewood, material for fences, logs, railroad ties, telegraph and telephone poles, materials for barrels, bark, and naval stores. The total value of these products in 1909 was \$6,308,151, compared with a value of \$2,494,452 for the

product of 1899, an increase of 152.9 per cent. Of the value in 1909 \$3,827,481 was reported as that of products used or to be used on the farms themselves, \$1,899,341 as that of products sold or for sale, and \$581,329 as the amount received for standing timber.

Manufactures. The rapid growth of the manufacturing industries of the State in the last 30 years has been due largely to the development of its rich mineral resources, particularly in the northern part, known as the "Birmingham district." The close proximity of the coal fields of this district to its iron mines has made the iron industry very prosperous, while the great abundance of available coal and extensive forest resources have given a marked impetus to other manufacturing industries.

The importance of the iron industry, as a whole, is due to the exploitation of the rich deposits of iron, coal, and limestone which are found in close proximity in the northern part of the State. These favorable conditions are conducive to the production of pig iron at a relatively low cost.

In 1909 lumbering was the most important single industry, from the standpoint of value of product, value added by manufacture and the number of wage-earners.

During the period from 1899 to 1904 the growth of the industries related to the manufacturing of cotton was remarkable. The number of establishments increased 48.4 per cent, and the value of the product 105.6 per cent. Although the percentages of increase were smaller during the period from 1904 to 1909, the figures indicate a continued development, as the table will show. It is interesting to note that from 1899 to 1904 the percentage of increase in the value of product was higher than that in the value added in manufacture, while in the period from 1904 to 1909 the rate of increase in value added by manufacture was far greater than that shown for value of product. This is due partly to the enormous rise in the price of cotton during the former period and partly to the manufacture of a better grade of goods during the latter period.

The great importance of the coke-making industry is due to the abundant supply of coal suitable for coking purposes and to the demand for coke for fuel in the manufacture of iron and steel.

The table below shows the essential details of the industries in the State whose product in 1909 was valued at more than \$1,000,000. The corresponding data for 1904 are also given.

As will be seen from this table, the total number of wage-earners engaged in the manufacturing industries of the State in 1909 was 72,148, compared with 62,173 in 1904. In 1909 the male wage-earners numbered 65,686, and the female 6462. There were 3653 wage-earners under 16 years of age, and of these 1380 were females. The greater number of children under 16 years of age are employed in the industries related to the manufacture of cotton goods. Of a total number of 12,734 wage-earners employed in these industries in 1909, 18.7 per cent were under 16 years of age.

There are seven cities in the State that are important manufacturing centres. These are Birmingham, Bessemer, Mobile, Montgomery, Anniston, Selma, and Gadsden. Of these Birmingham is by far the most important. The growth of this city in the decade 1900-1910 is

one of the most remarkable instances of rapid increase of population on record. (See *Population*, below.) There were, in 1909, 8999 wage-earners in Birmingham, compared with 3987 in 1904. The value of the products of its industries was \$24,128,214 in 1909, as against \$7,592,958 in 1904. The causes for this phenomenal growth are noted above.

Transportation and Commerce. Alabama has excellent facilities for transportation by both land and water routes. The Alabama and Tombigbee rivers and their tributaries afford

The railway mileage of the State in 1912 was 5295 against 4752 in 1906. Nearly every trunk line in the South passes through Birmingham. In 1907 the Legislature passed many stringent measures designed to regulate and control the railways passing through the State, and attempts to enforce some of these led to a conflict of authority between the State and Federal governments. There is a State Railroad Commission, which, among other things, has the power of general supervision of railroad rates. Mobile is the only seaport. Much of the cotton

COMPARATIVE SUMMARY MANUFACTURES FOR 1909 AND 1904

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY				Primary horse-power	Capital	Salaries	Wages	Cost of materials	Value of products	Value added by manufacture
			Total	Proprietors and firm members	Salaried employees	Wage-earners (average number)							
Expressed in thousands													
STATE—All industries...	1909	3,398	81,972	3,769	6,055	72,148	357,837	\$173,180	\$6,565	\$27,284	\$83,443	\$145,962	\$62,519
	1904	1,882	67,884	1,948	3,763	62,173	293,185	105,383	3,867	21,878	60,458	109,170	48,712
Bread and other bakery products.....	1909	83	773	94	105	574	334	898	93	248	1,073	1,725	652
	1904	52	585	59	51	475	251	473	42	161	666	1,110	444
Brick and tile.....	1909	71	1,500	56	91	1,353	5,127	1,942	100	434	288	1,135	847
	1904	63	1,178	60	74	1,044	3,360	1,033	72	301	204	847	643
Cars and general shop construction and repairs by steam-railroad companies..	1909	21	6,610	.....	302	6,308	4,928	4,732	313	3,372	3,775	7,528	3,753
	1904	16	5,740	.....	239	5,501	3,125	2,104	235	2,993	3,306	6,681	3,375
Coke.....	1909	35	2,800	.....	220	2,580	5,766	17,770	226	1,283	6,371	8,843	2,472
	1904	24	2,272	.....	107	2,165	3,075	3,425	96	924	3,997	6,175	2,178
Cotton goods, including cotton small wares.....	1909	51	13,041	.....	310	12,731	42,637	30,954	460	3,454	14,373	22,212	7,839
	1904	46	11,740	1	259	11,480	27,505	24,758	343	2,458	12,011	16,760	4,749
Fertilizers.....	1909	42	1,473	12	228	1,233	4,484	8,507	305	392	4,264	6,423	2,159
	1904	19	636	6	79	551	1,485	3,051	68	153	1,606	2,341	735
Flour-mill and grist-mill products.....	1909	72	315	84	63	168	3,559	1,080	51	57	2,405	2,779	374
	1904	40	230	42	29	159	2,124	372	20	54	1,556	1,750	194
Foundry and machine-shop products.....	1909	102	6,462	67	497	5,898	9,859	11,984	662	2,958	6,227	11,550	5,323
	1904	71	4,943	43	311	4,589	5,376	6,192	426	2,133	4,588	8,840	4,252
Iron and steel, blast furnaces.....	1909	19	4,325	.....	542	3,783	106,189	23,816	740	2,077	15,477	21,236	5,575
	1904	19	5,216	.....	262	4,954	101,048	19,326	321	1,939	11,012	16,646	6,349
Lumber and timber products	1909	1,819	25,927	2,387	1,131	22,409	102,527	24,442	1,168	7,259	9,145	26,058	16,913
	1904	666	17,751	836	780	16,135	55,512	14,164	814	5,546	5,195	18,279	13,084
Oil, cottonseed, and cake...	1909	71	1,984	13	353	1,618	17,215	7,202	334	437	7,075	9,178	2,103
	1904	58	1,698	17	281	1,400	12,883	5,169	254	381	4,554	5,769	1,215
Printing and publishing....	1909	274	1,955	299	539	1,117	1,092	2,010	462	650	666	2,768	2,102
	1904	241	1,462	269	278	915	712	1,469	245	469	432	1,947	1,515
Turpentine and rosin.....	1909	175	3,965	255	191	3,519	384	1,397	125	906	486	2,472	1,986
	1904	144	3,342	229	194	2,919	151	767	99	745	511	2,434	1,923

means for inland navigation, while the Tennessee, which sweeps across the northern part of the State, is navigable to Chattanooga, Tenn., and for small craft as far as Knoxville. Mobile is one of the most important ports on the Gulf of Mexico, and, in addition, the ports of New Orleans and Pensacola in neighboring States are easily accessible. The State has more miles of navigable rivers than any other in the South, but improvement and development have been slow. In 1907 the Mobile Basin and Tennessee River Association was organized to work for the improvement of Alabama waterways. The United States government began in 1910 to make extensive changes in the Alabama and Coosa rivers to Wetumpka, and on the Warrior and Tombigbee rivers.

for export and eastwise shipment goes to Savannah, and most of the lumber to Pensacola.

Banks. There were in the State on Dec. 2, 1912, 324 banks of all classes. The national banks numbered 85, with a capital of \$9,700,000, deposits of \$35,935,708, and total resources of \$66,942,019. There were 11 savings banks, with 24,925 depositors, and deposits aggregating \$2,652,784, and 214 State banks with a capital of \$10,073,390, and savings deposits of \$6,541,489.

Finance. The bonded debt amounts to \$9,057,000, about half of which was created during the reconstruction period, known as the "carpet-bag" régime. Of this debt \$8,103,000 was refunded in 1906, \$7,137,000 matures July 1, 1956, and bears interest at the rate of 4 per cent; the balance, \$966,000, matures Jan.

1, 1956, and bears interest at the rate of 3½ per cent. Interest on both sums is payable semi-annually, on the first days of January and July of each year. The remainder of the bonded debt, \$954,000, matures in 1920 and bears interest at the rate of 4 per cent, payable semi-annually, on the first days of January and July. No provision is made for the final extinction of this debt. New debts can be incurred only for purposes of repelling invasion or suppressing insurrection. Valuation of property has increased from \$130,000,000 in 1880, and \$383,420,000 in 1906, to \$566,807,488 in 1912. The tax rate is limited to 65/100 of 1 per cent (6½ mills on the dollar), on the value of taxable property for State purposes, and ¾ of 1 per cent for county purposes. Of the levy for State purposes, 30 cents on \$100, by constitutional provision, is applied to the support of common schools, and the remaining 25 cents is applied to general purposes, including pensions to indigent surviving Confederate soldiers and the widows of Confederate soldiers, support of State high schools and colleges, salaries, and other expenses. The net receipts for the fiscal year ending Sept. 30, 1912, from all sources, were \$6,061,236.68, and net disbursements for the same period \$5,906,255.56. The principal sources of revenue are: tax on property and polls about 60 per cent; license about 22 per cent; and earnings of convicts about 18 per cent. Of the disbursements, about 50 per cent was expended for schools, colleges, and eleemosynary institutions; about 16 per cent for pensions to indigent surviving Confederate soldiers and widows of deceased Confederate soldiers; about 10 per cent for maintenance of the convict department; about 6 per cent for interest on the bonded debt; about 2 per cent for feeding and removing State prisoners; and the remaining 16 per cent was expended for miscellaneous subjects, including salaries of heads and employees of State departments, and expenses of same, State judiciary, State national guard, etc. The balance, Oct. 1, 1912, was \$262,052.38.

Education. The condition of public education in Alabama has been unsatisfactory since the close of the Civil War. The causes are many: some are local and indicate conditions which will be remedied. There is no compulsory education law in the State, and those who are in charge of the schools have no means of compelling attendance. The large proportion of negroes in the State adds another difficulty to the problem. These causes have resulted in a percentage of illiteracy in Alabama that is exceeded in but two other States, South Carolina and Louisiana. In 1910 the illiterates numbered 352,710, or 22.9 of the entire population. The percentage among the native-born whites was 10.1, while among the negroes it was 40.1. That conditions are improving, however, is shown by the fact that the percentage among the native whites in 1900 was 15.2, and among the negroes 57.4. The percentage for the entire population in 1900 was 34.

According to the thirteenth census, the school population, ages 6 to 20, in 1910 was 750,357, while those attending school numbered 385,449. Of those attending school 244,992 were white and 133,191 were negro. According to statistics supplied by the State Superintendent of Public Instruction the school population of the State in 1912 was 727,297. The white children num-

bered 399,273 and the colored 328,024. The number enrolled in the schools was 446,301, and of these 299,844 were white and 146,547 were colored. In schools for white children were 7972 teachers, and in those for colored children, 2907. The average yearly salary for white teachers was \$376 and for colored \$160. The total amount expended for teachers' salaries, including county superintendents, aggregated \$3,703,711.

There is no legal provision for taxation for educational purposes in the State, but each county is allowed, under the constitution, upon a vote of 60 per cent of the people, to levy a tax of 1 mill or 10 cents on each \$100 of property, to obtain a supplemental school fund for the exclusive use of the county levying it.

In 1912 there were 2941 graded schools for white children in the State, and 814 for negroes. These graded schools form for the whites two-thirds, and for the negroes two-fifths of all the schools in the State. The teachers, especially those in colored schools, have heretofore lacked many qualifications. Recent legislation has, however, greatly improved and strengthened the teaching force. Successful efforts are being made to improve the condition of the elementary rural schools by grading, closer supervision, and the vitalizing of school work.

Forming a part of the educational system of the State are the University of Alabama (q.v.) at Tuscaloosa, the Alabama Polytechnic Institute (q.v.) at Auburn, the Alabama Girls' Technical Institute at Montevallo, normal schools at Florence, Jacksonville, Troy, Livingstone, Daphne for white teachers, and at Moundville, Montgomery, Normal, and Tuskegee for negroes. There are also 9 district agricultural schools, and the Northeast Alabama Agricultural and Industrial Institute at Lineville. Private institutions are St. Bernard College at Cullman; Howard College at East Lake; Southern University at Greensboro; Birmingham College at Birmingham, Spring Hill College at Spring Hill, and 8 colleges for women. The work of the Tuskegee Normal and Industrial Institute (q.v.) is widely and favorably known.

Charitable and Penal. The State institutions comprise the Institution for the Deaf, Dumb and Blind, at Talladega; hospitals for the insane, at Tuscaloosa and Mount Vernon; a penitentiary, at Wetumpka; and nineteen branch prisons, where State convicts are kept. The State owns cotton farms and a cotton mill, where labor is performed by boys and women convicted of offenses by the courts. The convict system has undergone radical improvements, but prisoners are still leased to contractors. The Legislature of 1907 made provision for special courts for juvenile offenders, and at the session of 1911 the office of State prison inspector was created. At this session there was authorized, also, the construction of a reformatory for wayward and delinquent females and of a reform school for juvenile negro law breakers.

Religion. As in other portions of the South, the Baptists and the Methodists have the field almost to themselves. Among other denominations, the strongest are the Presbyterian, Catholic, Christian, and Episcopalian.

Population. The State has shown a steady increase in population, as will be seen from the tabulation by decades: In 1820, 127,901; 1830, 309,527; 1840, 590,756; 1850, 771,623; 1860, 964,201; 1870, 996,992; 1880, 1,262,505; 1890,

1,513,617; 1900, 1,828,697; 1910, 2,138,093. The increase in the decade 1900-10 was 16.9 per cent, which was greater than the increase in any other of the East South Central Division of the States, which includes Kentucky, Tennessee, Alabama, and Mississippi. Alabama ranks eighteenth in population among the States. In 1840 her rank was twelfth, but she has gradually fallen back since that time. The population per square mile in 1910 was 41.7, as against 35.7 in 1900 and 29.5 in 1890.

That the population of the State is preponderantly rural is shown by the fact that in 1910 the rural population was 1,767,663, while the urban was only 370,431. There was, however, an increase of 55.9 per cent in the urban population in the decade 1900-10, while the rural population increased but 11.5 per cent.

The white population in 1910 was 1,228,832, while the negroes numbered 908,282. The white population in 1900 was 1,001,152, and the negro 827,307. The white population, as is true of most of the Southern States, is almost entirely native born. The foreign population in 1910 numbered only 19,286. Of the native white population in 1910, 597,894 were males and 579,565 were females, and there were 103.2 males to 100 females.

The negroes are centred largely in the cotton belt, where they find ready employment as laborers. In certain counties of this belt they outnumber the whites five to one, but in other counties outside the cotton belt these conditions are reversed. The negroes in the rural communities have, in recent years, shown a tendency to gravitate to the cities.

Cities. Birmingham is the largest city in the State, with a population in 1910 of 132,685. Its population in 1900 was 38,415, and the rate of increase in the decade was 245.4 per cent. Only two other cities in the United States increased more rapidly, and these were practically created during the decade. The other large cities are Mobile, 1910, 51,521; 1900, 38,469; Montgomery, the capital, 1910, 38,136; 1900, 30,346; Selma, 1910, 13,640; 1900, 8713; Anniston, 1910, 12,794; 1900, 9695; Bessemer, 1910, 10,864; 1900, 6358, and Gadsden, 1910, 10,557; 1900, 4282. There were 22 cities with a population of over 4000 in 1910, compared with 16 in 1900.

Government. The present constitution was adopted in 1901. The constitutional convention which met in that year devoted a great part of its deliberations to an attempt to evolve a law which would practically eliminate negro suffrage. The following provisions of the constitution accomplished this purpose: In order to register prior to Dec. 20, 1902, the applicant must have engaged in, or have been the descendant of one who has participated in, one of the following events: The War of 1812, the Mexican War, any war with the Indians, the war between the States, the war with Spain, or served with the forces of the Confederate States, or of the State of Alabama in the war between the States; and he must have been an individual of good character, and one who understood the duties and obligations of citizenship under a republican form of government. Since Jan. 1, 1903, the applicant for registration has been required to be able to read and write any article of the Constitution of the United States in the English language and be physically able to work, or to be able to read and write such article, and to have been engaged in some regular trade

or occupation for the greater part of the 12 months next preceding the time he offers to register; or if he is unable to read or write, such inability must be due to physical disability; or the applicant must be the owner in good faith in his own right, or the husband of a woman who is the owner in good faith in her own right, of 40 acres of land situated in the State; or to be the owner or husband of the owner of real or personal property assessed at \$300.

Any person guilty of criminal offense, including the selling, buying, or offering to sell or buy a vote, is debarred from voting. Each county has a board of registrars, consisting of three members who issue the certificates to those entitled to hold them. An amendment to the constitution may be secured by a two-fifths vote of each house, ratified by a vote of the people. A constitutional convention may be called when voted by a majority of each house and ratified by the people, and the power of such conventions in altering, revising, or amending is subject to no restrictions.

Legislative.—The legislative body consists of a Senate and a House of Representatives, the maximum limit of membership being 35 and 107 respectively. The number of Senators must not be more than one-third nor less than one-fourth that of Representatives. Senatorial districts are composed of contiguous undivided counties. Elections are held the first Tuesday after the first Monday in November of every fourth year, and the Legislature meets on the second Tuesday in the following January, the session being limited to 50 days. Members are paid \$4 per day and traveling expenses. Revenue bills originate in the House and cannot be passed in the last five days of the session. The Legislature must provide for the revision of the statutes every twelfth year. One of the numerous legislative prohibitions prevents the State from engaging in or aiding in internal improvements, but in 1908 an amendment to the constitution became operative, limiting the prohibitions referred to as follows: "Provided that the State may under appropriate laws cause the net proceeds from the State convict fund to be applied to the construction, repair, and maintenance of public roads in the State, and the Legislature may make additional appropriations for that purpose."

Executive.—A governor, lieutenant-governor, attorney-general, State auditor, secretary of State, State treasurer, superintendent of education, and commissioner of agriculture and industries are elected every fourth year, at the time and place appointed for the election of members of the Legislature. None of these officers is eligible for reelection, and the governor is not eligible to election or appointment to any office in the State, or to the Senate of the United States, during his term or within one year after the expiration thereof. The lieutenant-governor is ex officio president of the Senate, and succeeds to the office of governor in case that office becomes vacant. The attorney-general, secretary of State, and State auditor constitute a board of pardons, to hear petitions for pardons, commutation, or parole in cases of felony, and advise the governor thereon; but the decision of the governor does not need to conform with that of the board. The governor may veto any bill, or any item of an appropriation bill; but a majority vote of each house may override the veto of the gov-

ernor. A bill becomes law if the governor fails to pass upon it within one week after it has been submitted to him.

The Legislature of 1907 created a State Tax Commission, with power to act as a State Board of Equalization and to recommend improvements in the tax laws. The Legislature of 1911 created a banking department and the office of State prison inspector. The salary of the governor was raised at this session from \$5000 to \$7500, and an executive mansion was purchased. An appropriation of \$100,000 for the improvement of the State Capitol at Montgomery was made. This was available in 1912-13. At this session a State board of arbitration and mediation for the settlement of labor troubles in coal mines was created, and the governor was authorized to appoint an inspector of coal mines for each 2,500,000 tons of coal.

Judiciary.—The judicial power of the State is vested in the Senate, sitting as a court of impeachment, a supreme court, circuit courts, chancery courts, courts of probate, such courts of law and equity inferior to the supreme court consisting of not more than five members, as the Legislature from time to time may establish, and such persons as may be by law invested with powers of a judicial nature. A circuit court, or a court having the jurisdiction of a circuit court, is held in each county of the State at least twice every year. The State is divided into five chancery divisions, with a chancellor for each division. The divisions are subdivided into districts, in each of which the chancellor holds court at least twice each year. Courts of probate exist in each county. Judges of the supreme, circuit, chancery, and probate courts are elected for a term of six years. For each judicial circuit a solicitor (prosecutor) is elected for a term of four years. Each precinct has two justices of the peace and one constable, excepting precincts lying within towns of over 1500 inhabitants, in which precincts the Legislature may establish inferior courts in lieu of the justices of the peace. The Legislature of 1911 created a State court of appeals of three members, elected for a six-year term at an annual salary of \$5000. This court has final jurisdiction in certain cases.

Local and Municipal Government.—The commission form of government is mandatory in cities of the first class, of which Birmingham is the only representative; and for cities with a population from 25,000 to 50,000, of which the only one is Montgomery. In cities of the second class, population 50,000 to 100,000, it is permissive, but not mandatory. For cities of 1000 and over, this form of government is permissive, on petition and favorable vote. Provision is made for the recall of commissioners. Up to June, 1913, the cities of Birmingham, Mobile, Montgomery, Cordova, Hartsell, Huntsville, Talladega, Tuscaloosa, and Sheffield, had adopted this form of government. Both county and municipal corporations are limited in their taxing and debt incurring powers. Each county elects a sheriff who serves for four years and cannot be re-elected. One year's residence is necessary to secure a divorce, the principal causes for which are desertion (two years) and habitual drunkenness. Civil service regulations are provided for cities of over 25,000. The capital is Montgomery (q.v.).

Elections.—The State, like most other Southern States, has a system of primary elections. The party State committees have power to fix

assessments on candidates, and are given other privileges, but in the main the elections are under State control. They must be held four months or more before the November elections, and on the same date in all parts of the State. These elections are for the State and county elective offices, representatives in Congress, and Presidential elections. The election of United States senators is, of course, governed by the Constitutional Amendment of 1912 providing for such elections. There are stringent laws against political contributions by corporations. The State has 12 votes in the Electoral College; prior to 1910 it had 11.

Militia.—The organized militia of Alabama, officially known as the National Guard, consists (1913) of 2581 men. The census of 1910 found 401,145 males of militia age. The National Guard is formed into one brigade, and consists of three regiments of infantry, two of 12 companies each and one of 10 companies, and two battalions of field artillery, composed of four batteries.

History. In 1540 De Soto passed through the territory now included in Alabama, and found it occupied by powerful Indian nations. Among them were the Alibamas, who gave their name to the country; the Chickasaws, the Choctaws, and the Creeks, together constituting the Muskogean family; the Cherokees and Apalaches. Alabama was included under Carolina in the royal grants made by the Stuarts in 1629 and 1663, but no attempts at settlement were made by the English. In 1702 the French, under Bienville, removed from Biloxi Bay, where a fort had been built some years previous, and erected Fort Louis, on Mobile River. Mobile was founded in 1711 and until 1720 was the capital of Louisiana. In 1714 Fort Toulouse was built at the junction of the Coosa and Tallapoosa. The growth of the colony was hindered by disease and poverty; the Chickasaws remained hostile, and the English planted their trading posts in the wilderness north of Mobile. When France ceded her possessions east of the Mississippi to England, in 1763, Alabama north of 32° 40' was added to the Illinois territory, and the part south of the line to West Florida. During the Revolution West Florida, which had by that time gained English and Scotch settlers, remained loyal, and in 1779-80 Spain took advantage of her own war with Great Britain to seize the province. After 1783 the United States, as the successor of England, claimed as far south as the thirty-first degree, but Spain continued to hold the territory south of 32° 40' till 1798. Georgia claimed between 31° and 35° to the Mississippi, but sold her rights in 1802. In 1798 Congress organized the region included between the Mississippi River on the west, the Chattahoochee on the east, the thirty-first parallel on the south, and a line drawn from the mouth of the Yazoo into Mississippi Territory, and in 1804 extended its northern boundary to Tennessee; in April, 1813, the Mobile district was taken from the Spanish by the United States and annexed to Mississippi Territory.

Incited by the British, the Creeks and their allied tribes rose in 1812 against the whites, their atrocities culminating in the great massacre at Fort Mims, on the Alabama River, Aug. 30, 1813. General Jackson headed the forces sent against the Indians, and by his victories at Talladega and the Horse Shoe Bend of the Tallapoosa, 1813-14, forced them to surrender their territory west of the Coosa and south of We-

tumpka. In a number of subsequent treaties the Indians gradually abandoned the larger portion of their land, until, between 1830 and 1836, they were removed in a body west of the Mississippi River. (See CREEKS.) Mississippi was set off March 1, 1817, and on March 3 was formed the Territory of Alabama, with its seat at St. Stephens. The first Legislature met at Huntsville, Jan. 19, 1818, and the State was admitted to the Union Dec. 14, 1819. In 1820 the seat of government was removed to Cahaba, in 1826 to Tuscaloosa, and in 1847 to Montgomery. The people of Alabama were aggressive champions of territorial expansion for slavery purposes, and took a prominent part in the Mexican War. They entered very zealously into the secession movement, and early in December, 1860, urged the Southern States to withdraw from the Union. At Montgomery, on Jan. 11, 1861, an ordinance of secession was passed by a vote of 61 to 39—the minority representing the northern part of the State, where the Whig party had been especially strong. Forts Gaines and Morgan, at the entrance to Mobile Bay, were seized, and on January 21 the Senators and Representatives withdrew from Congress. Delegates from the seceded States met at Montgomery, February 4, and organized the Confederate government. A Confederate arsenal, foundry, and navy yard were soon established at Selma. In February and April of 1862 Federal troops occupied the Tennessee valley. In August, 1864, Farragut destroyed a Confederate fleet in Mobile Bay, and, aided by General Granger with a land force, reduced Forts Gaines and Morgan. In April, 1865, the Union forces took Selma, Tuscaloosa, Montgomery, and Mobile. A provisional government was established June 21, 1865, and a convention repealed the act of secession and altered the constitution. State officers and members of Congress were chosen; but Congress, in conflict with President Johnson, refused admission to the representatives from Alabama. By the reconstruction act of March 2, 1867, Alabama was included with Georgia and Florida in the third military district, under General Pope. In November a new constitution was framed, which received, February, 1868, 70,182 votes out of 71,817 cast, and though the majority of registered voters had remained away from the polls, Congress declared the constitution operative, and it continued in force till 1875, when a new constitution was adopted. On July 14, 1868, military rule ceased, and on Nov. 16, 1870, the State ratified the fifteenth amendment to the Federal Constitution. For a decade after the Civil War, Alabama suffered from maladministration. Party spirit ran very high, and elections were bitterly contested. The dishonesty of officials and the extravagant railway policy they pursued brought the State and the chief towns into serious financial difficulties. With the reorganization of the public debt in 1876 began an era of quiet and prosperity. Cotton and steel manufactures, lumbering, and the mining industries thrived enormously, and many large towns sprang up in the northern part of the State. Agricultural interests, by comparison, showed little growth. Educational progress did not keep up with economic development until the end of the nineteenth century. Since 1874 Alabama has been invariably Democratic.

The wave of prohibition sentiment which passed over nearly all the Southern States in the early years of the twentieth century included

Alabama. The Legislature of 1907 passed local option measures which became effective Jan. 1, 1908. These resulted in the gradual elimination of the legalized liquor traffic in most of the 67 counties of the State and in a majority of the 500 towns. Attempts were made in several counties to have certain provisions of the local option act declared unconstitutional, but they were upheld by the Supreme Court of the State. In 1908 there was such an apparent demand for still more stringent prohibition measures that the Legislature was called in special session to pass additional laws. The result was a so-called State-wide prohibition bill, which made the whole State "dry" by legislative enactment on Jan. 1, 1909. Flaws which led to evasions in its enforcement were found in the administrative features of this law, and in July, 1908, the Legislature again met in special session to provide additional safeguards. The measure passed at this session has been called the most drastic prohibition act ever passed by any State. Officers were given authority to close any place where it was suspected that liquor was sold, and the burden of proof was placed on the defendants. All forms of liquor advertising were forbidden, and provision was made for the impeachment of any officer failing to enforce the law. The transportation of liquor from one person to another was forbidden. This provision, however, which was considered the strongest administrative feature of the law, was pronounced unconstitutional by the courts. The Legislature provided also for an election on an amendment providing for constitutional prohibition. The results of this election, held on March 19, 1909, showed a remarkable reaction against prohibition. The proposed amendment was defeated by over 27,000 votes. In the following year, 1910, State-wide prohibition suffered still other defeats. Emmett O'Neal made his campaign for governorship on a local option platform, while his opponent for the Democratic nomination, Col. H. S. D. Mallory, strongly advocated prohibition. O'Neal was nominated by a majority of over 15,000, and with him a majority of the members of the Legislature pledged to local option. As a result the Legislature of 1911 passed a law known as the Parks local option bill. This practically repealed the stringent measures passed in 1908-09. This law makes the county the unit in voting in the liquor question, and elections can be held only on the petition of 45 per cent of those voting at the previous election. Counties are also allowed to decide whether liquor shall be sold by a dispensary. The Anti-saloon League (q.v.) tested this law in the State courts in 1912, and it was pronounced constitutional. The Legislature of 1911 passed also a bill regulating the sale of liquor under licenses in incorporated places. The sale between the hours of 11 P.M. and 6 A.M. is forbidden, and the number of saloons is limited according to population. Under the Parks law 15 counties voted in 1911 and two in 1912. Nine voted for no license, seven for license, and one for a dispensary. These counties voting for license were, in general, those in which the larger cities of the State are situated.

The passage of unusually severe laws for the regulation of railways and other corporations by the Legislature of 1907 resulted in conflict between the State and Federal authorities on the question of State rights. For a discussion of this subject see STATE RIGHTS.

The deaths of Senators J. T. Morgan and E. W. Pettus in 1907 gave an opportunity for putting into effect the so-called Alabama Alternate Succession Plan. As both these Senators were aged men, at the primaries held in 1906 votes were cast for Senators to succeed them in the event of the death of one or both. John H. Bankhead was nominated to succeed Senator Morgan, and J. E. Johnston to succeed Senator Pettus. Senator Bankhead was reelected in 1911 and Senator Johnston died in 1913.

On Aug. 10, 1909, the Legislature, in special session, ratified the income tax amendment to the Constitution, and was the first State legislature to take such action.

A decision relating to the alleged practice of peonage in the South, which is likely to be historic in that connection, was rendered in the United States Supreme Court in January, 1911. This decision overturned the Alabama law, which hitherto ruled in these cases. Alonzo Bailey, a negro, had a contract to work as a farm-hand at a wage of \$12 per month. He received in advance \$15. After working for a little over a month he stopped work, but did not refund the money. According to the Alabama law such refusal to work and refund the money was *prima facie* evidence of intent to defraud. The defendant is required to prove the contrary, but cannot testify directly as to his intentions. He is, therefore, practically convicted of fraud by stopping work and is heavily fined, and in lieu of payment is put to work without remuneration. This case was before the United States Supreme Court for several years. By the decision rendered in 1911 the Alabama law was declared unconstitutional.

Alabama is consistently Democratic in State and national elections. As noted above, Emmett O'Neal was elected governor in 1910. His term expires in 1915.

In the presidential election of 1908, Bryan received 74,370 votes and Taft 25,305. In the election of 1912 Wilson received 82,439 votes. Roosevelt, 22,689, and Taft, 9731. By the apportionment of 1910 Alabama has 10 Representatives in Congress, whereas previously there were but 9.

The following is a list of the governors of the State, and the parties to which they belonged:

TERRITORIAL GOVERNOR

William W. Bibb 1817-19

STATE GOVERNORS

W. W. Bibb Democrat 1819-20
 Thomas Bibb " 1820-21
 Israel Piekens " 1821-25
 John Murphy " 1825-29
 Gabriel Moore " 1829-31
 Samuel B. Moore " 1831
 John Gayle " 1831-35
 Clement C. Clay " 1835-37
 Hugh MeVay " 1837
 Arthur P. Bagby " 1837-41
 Benjamin Fitzpatrick .. " 1841-45
 Joshua L. Martin " 1845-47
 Reuben Chapman " 1847-49
 Henry W. Collier " 1849-53
 John A. Winston " 1853-57
 Andrew B. Moore " 1857-61
 John G. Shorter " 1861-63
 Thomas H. Watts " 1863-65
 Lewis E. Parsons Provisional 1865

Robert M. Patton Republican 1865-67
 Wager Swayne .. (Military Governor) .. 1867-68
 William H. Smith Republican 1868-70
 Robert B. Lindsay Democrat 1870-72
 David P. Lewis Republican 1872-74
 George S. Houston Democrat 1874-78
 Rufus W. Cobb " 1878-82
 Edward O'Neal " 1882-86
 Thomas Seay " 1886-90
 Thomas G. Jones " 1890-94
 William C. Oates " 1894-96
 Joseph F. Johnston ... " 1896-1900
 William J. Sanford ... " 1900-01
 William D. Jelks " 1901-07
 Braxton B. Comer " 1907-11
 Emmett O'Neal " 1911-15

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ALABAMA, UNIVERSITY OF. A co-educational State institution established in 1831 at Tuscaloosa, Ala. It comprises a College of Arts and Sciences, a College of Engineering, schools of Law, Medicine, and Pharmacy, the last two at Mobile, and a summer school which in 1913 had 562 students, the total student registration for that year being 1214 with a faculty of 89. The University has a library of 30,600 volumes, grounds and buildings valued at \$1,225,000, an endowment of \$545,000, and an income of \$162,500. President, G. H. Denny, Ph.D., LL.D.

ALABAMA CITY. A town in Etowah Co., Ala., 56 miles north of Birmingham, on the Louisville and Nashville, the Alabama Great Southern, the Nashville, Chattanooga, and St. Louis, and the Southern railroads (Map: Alabama, C 1). It is situated in an agricultural region producing corn, oats, cotton, wheat, and hay. Coal and red ore are also found in considerable quantities. The city has a large cotton mill and a steel company. Pop., 1900, 2276; 1910, 4313.

ALABAMA CLAIMS. A series of claims for indemnity made upon Great Britain by the United States, based upon the alleged omission of Great Britain to observe the obligations imposed by international law upon neutral nations with reference to their dealings with, and duties to, belligerents. The claims, in most particulars, arose from damages inflicted by vessels in the Confederate service which had been fitted out or built in English waters and allowed to sail thence. The Declaration of Paris (q.v.), adopted in 1856 by most of the nations of Christendom, had abolished privateering, and, though the United States was not a party to the convention, this decree had become a recognized principle of

international law. Moreover, both the United States and England had passed acts early in the century prohibiting the equipment of land or sea forces for the purpose of operating against the territory or commerce of a friendly nation, and making it the duty of the government to prevent such filibustering (Act of Congress of April 20, 1818, 3 Stats. at Large, 448; Foreign Enlistment Act, 59 George III, cap. 69). It was upon these acts and principles affecting international relations that the claims of the United States were founded.

The facts of the case were these: Following President Lincoln's call for volunteers, President Davis of the Confederate States offered letters of marque and reprisal (q.v.) to private vessels to prey upon the commerce of the United States. Prompt advantage was taken of this offer, and numerous privateers issued from southern ports to harry the New York and New England merchant marine. Meanwhile Queen Victoria had issued her proclamation of neutrality, forbidding her subjects to take part with either side, and directing her official servants to accord belligerent rights to both parties to the struggle. Equipment was forbidden the vessels of both belligerents. Notwithstanding this proclamation, and the repeated and urgent protests of the American Minister, Charles Francis Adams, the sympathy of British officials, especially in the colonial ports, with the Southern cause was notorious, and harbors like Nassau in the West Indies became the refuge of Confederate cruisers.

The history of the *Alabama* is typical of the more flagrant cases submitted to the tribunal of arbitration. She was built at Birkenhead, England, under circumstances of great suspicion. The attention of the British government was repeatedly called to the case, and finally some steps were taken by the authorities to detain the vessel; but "No. 290," as she was called, left port without register or clearance papers, July 29, 1862, and, taking on her equipment in the Azores from two English vessels, assumed the name *Alabama*, under which she became famous and set out on her career of destruction. In much the same manner the *Florida*, *Georgia*, *Shenandoah*, and various other cruisers eluded the watchfulness of British officials. Before her destruction by the *Kearsarge*, June 19, 1864, the *Alabama* is said alone to have captured and destroyed 70 vessels of the United States.

The first phase of the controversy appeared in 1862, in the negotiations between the American Minister, Mr. Charles Francis Adams, and Lord John Russell, with reference to the alleged violation of England's Foreign Enlistment Act (1819) by the *Alabama*, and the obligation of the English government to detain her. This the government finally agreed to do; but action was delayed three days because Sir John Harding, an important official before whom the papers had been laid, was suddenly seized with an attack of insanity. The Confederate captain availed himself of this respite and sailed from Liverpool one day before orders arrived for the retention of his vessel. As a result, an enormous loss was inflicted upon American shipping.

Was Great Britain responsible for this, and, if so, to what extent? The solution of this question was the most important problem of diplomacy left as a result of the Civil War. As early as 1865, steps were taken to determine a method of adjustment; but it was not till 1871 that a basis for adjudication was agreed upon,

in the important Treaty of Washington, May 8. By this treaty it was stipulated that all claims known generically as the "Alabama claims" should be submitted to the decision of five arbitrators, one named by England, one by the United States, and one each by the King of Italy, the Emperor of Brazil, and the President of the Swiss Confederation. For the guidance of this court of arbitration, the Treaty of Washington laid down the important "three rules" defining the obligation of a neutral power to use "due diligence" to prevent the hostile use of its ports against a friendly nation. In accordance with this arrangement, the court met at Geneva, Dec. 15, 1871. The chairman of the court was Count Federigo Sclopis, the arbitrator named by the King of Italy; and the other members were Baron d'Itajuba, Brazilian Minister at Paris, Jacob Stämpfli, for three terms President of the Swiss Confederation, Sir Alexander Cockburn, and Mr. Charles Francis Adams. The chief counsel for England was Sir Roundell Palmer, and the American counsel were William M. Evarts, Caleb Cushing, and Morrison R. Waite. The American case, however, was prepared by Mr. J. C. Bancroft Davis. Both the case and the counter-case were prepared and maintained with great ability and acumen, and the arguments were followed with marked interest. More than once, however, a premature termination of the proceedings was threatened by the insistence of the American counsel upon the fact that in estimating the indemnity not only direct damages should be considered, but also such indirect losses as had befallen citizens of the United States through the decrease of trade, the increase of insurance rates, the prolongation of the war, and the additional cost of the prosecution of the war caused by these cruisers. Finally, the claims of the United States for indirect damages were unanimously rejected, on the ground that the principles of international law did not sanction an award of compensation between nations upon claims of that indefinite character. On Sept. 14, 1872, the final award was signed, by which it was decreed that England had incurred no liability arising from the action of the *Sumter*, the *Nashville*, the *Georgia*, the *Tallahassee*, and the *Chickamauga*, or of their tenders, and by a vote of three to two that England had incurred no liability for the work of the *Retribution*. It was, however, determined, by a vote of three to two, that England was responsible for a portion of the acts committed by the *Shenandoah*; by a vote of four to one that England was liable for the results of all the operations of the *Florida*; and by a unanimous vote that England was responsible for all the depredations of the cruiser *Alabama*; and that liability also attached to the acts of the tenders of the *Florida* and the *Alabama*. The consideration of claims arising from the operations of other vessels was excluded for want of evidence. Instead of awarding specific damages apportioned against the several ships and among the several private parties injured, the court awarded a single sum of \$15,500,000, as a full indemnity of all claims against Great Britain. This amount was accordingly paid in the following year. In order to determine the claims of private owners, and to distribute the fund among such claimants, Congress created, by the statute of June 23, 1874, a claims court by which judgments were rendered aggregating \$9,315,753. A second and similar court was established by

the statute of June 5, 1882. The indirect results of this arbitration—which belong rather to the history of international law than to that of the case under consideration—were of even greater importance than its direct results. In strengthening the principle of arbitration as a means of settling grave international differences, in furnishing a high example of justice and disinterestedness in judging between nations, and in defining and elevating the conception of national responsibility, the Geneva tribunal rendered an incalculable service to humanity. The rules laid down for the government of the arbitrators and the court will be found under the title **WASHINGTON, TREATY OF**. For its permanent contributions to international law, see that title. The circumstances under which the case was submitted to arbitration, and its relation to other questions of difference between England and the United States existing at the time, are explained in the articles on **ARBITRATION, INTERNATIONAL LAW**, and **WASHINGTON, TREATY OF**.

Bibliography. For the most recent and complete work upon the Geneva arbitration, consult: J. B. Moore, *International Arbitrations*, pages 495–682 (Washington, 1898); and for a discussion of the claims courts, pages 4639–4685 of the same work; also Baleh, *The Alabama Arbitration* (Philadelphia, 1900); Beaman, *The Alabama Claims and their Settlement* (Washington, 1871); Davis, *Mr. Fish and the Alabama Claims* (Boston, 1893); C. F. Adams, *Life of Charles Francis Adams* (Boston, 1900); D. H. Chamberlain, *Charles Sumner and the Treaty of Washington* (1902); for discussions of special phases of the subject, Bullock, *Secret Service of the Confederate States* (London, 1883); R. Semmes, *The Cruise of the Alabama* (London, 1864); and A. Sinclair, *Two Years on the Alabama* (Boston, 1895). For the British side of the controversy, consult Fitzmaurice, *Life of Granville* (1905). A remarkable collection of printed and manuscript official papers pertaining to the arbitration was made by Hon. J. A. J. Creswell and given to the Johns Hopkins University.

ALABAMA POLYTECHNIC INSTITUTE, originally the ALABAMA STATE AGRICULTURAL AND MECHANICAL COLLEGE. A college at Auburn, Ala., organized in 1872, under the Federal land grant act of 1862. The value of its grounds, buildings, and equipment in 1913 was \$476,000, and its total income was about \$71,000. It has a campus and forum of 304 acres. The library in 1913 contained 25,000 volumes; the faculty numbered 70 and the students 810, in preparatory, collegiate, chemical, and agricultural, pharmaceutical, and engineering courses.

AL'ABAN'DITE, or MANGANBLENDE. A black, sub-metallic mineral manganese sulphide. It often accompanies other ores of manganese, as at Tombstone, Ariz., and Snake River, Colo.

AL'ABASTER (Gk. ἀλάβαστρος, *alabastros*), a box or casket of alabaster, the name of the mineral being ἀλαβαστρίτης, *alabastritēs*, which according to Pliny, *Nat. Hist.*, xxxvii, 10, 54, § 143, was derived from the Egyptian town Alabastron, where it was quarried). A name given to two kinds of white stone, chemically distinct, but resembling each other in appearance, and both used for ornamental purposes.

Alabaster proper is a white, granular, semi-transparent variety of gypsum (q.v.) or sulphate of lime. It occurs in various countries, but the finest is found near Volterra, in Tuscany, where

it is worked into a variety of the smaller objects of sculpture, vases, timepiece stands, etc. Gypseous alabaster of good quality is also found in Derbyshire, England, and many ornamental articles are made of it at Matlock and other places. Small quantities of the material are obtained from Nova Scotia and at Loekport, N. Y. Being slightly soluble in water, it cannot be exposed to the weather; and its softness causes the surface easily to become rough and opaque. Nor is it generally found in sufficient masses for large works.

The other stone is a compact, crystalline carbonate of lime, deposited from water in the form of stalagmite, etc. It is distinguishable from the gypseous alabaster by its effervescing with an acid and by its greater hardness; real alabaster may be scratched with the nail. See **GYP SUM**.

ALABASTER, WILLIAM (1567–1640). An English divine, scholar, and poet, born at Hadleigh, Suffolk. He was educated at Trinity College, Cambridge, and in 1596, as chaplain to Robert, Earl of Essex, accompanied the expedition led by the latter against Cádiz. In Spain he was converted to the Roman Catholic faith; but having subsequently again become Protestant, he was appointed a prebendary of St. Paul's Cathedral and was presented to the living of Tharfield, Hertfordshire. "He was," says Fuller (*Worthies of England*), "an excellent Hebrician, and well skilled in cabalistical learning"; statements verified by such treatises as the *Apparatus in Revelationem Jesu Christi* (1607), placed on the *Index Librorum Prohibitorum* by papal authorities, and the *Commentarius de Bestia Apocalyptica* (1621), and by his *Lexicon Pentaglotton* (1637). By Anthony à Wood (*Athenæ Oxonienses*) he is hyperbolically styled "the rarest poet and Grecian that any one age or nation produced." His poetic reputation must depend largely on his Latin tragedy *Roxana* (1632), written in the Senecan manner and frequently presented in the hall of Trinity. This tragedy was referred to by Dr. Johnson (*Life of Milton*) as the only noticeable specimen of Latin verse of English authorship previous to the appearance of Milton's elegies.

ALACOQUE, ä'lä'kök', MARGUERITE MARIE (1647–90). A French nun, whose visions gave rise to the adoration of the Sacred Heart of Jesus. She was born in Burgundy, July 22, 1647. She took the veil in the convent of the Order of the Visitation, at Paray-le-Monial, where she is said to have performed miracles, prophesied, made revelations, and held direct communication with God and the angels. She foretold the day of her death (Oct. 17, 1690) and cut the name Jesus Christ on her bosom with a knife. She was beatified by Pius IX in 1846.

ALACRANES, ä'lä-krä'nēs. A group of small islands, surrounded by dangerous reefs, on the Campeche Bank in the Gulf of Mexico, 90 miles north of Progreso, in the State of Yucatan, Mexico.

ALA-DAGH, ä'lä-däg' (Turk. Mottled Mountain). A mountain chain in Asiatic Turkey, over 11,000 feet high (Map: Turkey in Asia, K 3). The chief portion of the chain is above the basin of Lake Van, forming part of the watershed between the Caspian Sea and the Persian Gulf.

ALAD'DIN. The hero of the *Arabian Nights* tale of *Aladdin and the Wonderful Lamp*. He

is a poor boy in China, who, through a strange adventure, gets possession of an old lamp and ring of magical properties. A chance rubbing of the former calls to his service a mighty genius (*djinn*), the "slave of the lamp," who quickly brings him to wealth, and, having given him the princess for his bride, builds him a magnificent palace in a single night. Later the lamp is lost in the absence of Aladdin, through the trick of the African magician who had formerly owned it, and who now, as a peddler, offers the princess "new lamps for old." He by its agency carries off the whole establishment to Africa, but the "slave of the ring" enables Aladdin to follow, and in the end the magician is slain, the lamp recovered, and Aladdin, with his home and bride, returned to prosperity in China. "Aladdin's lamp" has become a proverbial expression.

ALADJA DAGH, ä-lä'jä däg. A mountain region of Russian Transcaucasia, occupying the eastern part of the province of Kars. It is noted as the place of a decisive engagement between the Russian forces under the Grand Duke Michael and the Turks under Mukhtar Pasha on Oct. 15, 1877. The Russians surrounded the Turkish force, which was entrenched at Aladja Dagh, with the result that a part of them fled toward Kars, while about 7000 surrendered. See **RUSSO-TURKISH WAR**.

ALAGOAS, ä'lä-gō'ash. A coastal state of Brazil in about 9° S. lat., formerly a district of the State of Pernambuco, which surrounds it on the north and west. Its southern and eastern boundaries are formed by the river São Francisco and the Atlantic Ocean, respectively. The area of Alagoas has been usually reported as 22,580 square miles, but a planimetric calculation by Padtberg returns 10,230 square miles. It consists of a coastal strip, about 45 miles wide, of low, marshy land with many lagoons, and a mountainous, forested interior. This region is hot and moist, but, in spite of fertile soil and abundance of water, the province is very sparsely settled, and agriculture is pursued on a limited scale, owing to the deadly climate and prevalence of cholera. The chief products are sugar, dye-woods, ipecac, tobacco, cotton, and coffee. Pop., 1890, 511,440; 1900, 642,249; 1906, 781,600; 1912 (est.), 790,000. Capital and chief port, Maceio (q.v.), which in 1908 had a population of 36,427. Consult *Recenseamento do estado das Alagoas* (Rio de Janeiro, 1898).

ALAGOAS. The former capital of the State of Alagoas, Brazil, situated on Lake Manguaba (Lagoa Manguaba) (Map: Brazil, K 5). Its chief trade is in hides, rum, sugar, cotton, and iron. Pop., 4000.

ALAI (ä-lī') **MOUNTAINS**. A mountain range of Russian Central Asia, in the territory of Ferghana, north of the Pamirs. It consists of a number of parallel ranges and is separated by the valley of the Kysyl-Su from the Trans-Alai chain. Its average altitude is nearly 16,000 feet, while a few peaks rise beyond 20,000 feet.

ALAIN DE LILLE, ä'län' de lël' (1114?-1203?). A Flemish Cistercian monk, called "the universal doctor"; distinguished in philosophy, theology, history, science, and poetry. He was appointed bishop, but soon resigned to enter a monastery. He wrote chiefly in verse on alchemy, natural philosophy, and doctrinal subjects. There is confusion about his identity, and comparatively little is known of his life; but he received his name from Lille, in Flanders,

probably his birthplace. His *Complaint of Nature*, translated from the Latin by Douglas M. Moffat, was published in New York in 1908. Consult M. Baumgartner, *Die Philosophie des Alanus de Insulis* (Münster, 1896).

ALAIS, ä'lë'. A town of the department of Gard, France, situated in a fertile plain on the right bank of the Gardon at the base of the Cévennes Mountains, 23 miles by rail northwest of Nîmes (Map: France, S., J 4). Alais is a very flourishing town, and owes much of its prosperity to the mineral wealth of the surrounding district, which produces coal, iron, lead, zinc, and manganese. The blast furnaces, mines, and factories of various kinds give employment to large numbers of men, and Gard may be justly called the Black Country of France. There is also an extensive trade in silk, glass, bricks and tiles. Pop., 1901, 24,940; 1906, 27,435; 1911, 29,831. There are here monuments to Florian, the novelist, and to Pasteur, who became famous after his studies of the silkworm disease then prevalent in Alais. Alais sided with the Protestants in the religious wars of the seventeenth century, and Louis XIII in person, accompanied by the Cardinal de Richelieu, besieged it, and having taken it in 1629, demolished its walls. Three years later, the Baron of Alais having taken part in the rebellion of Montmorency, the castle was destroyed. Protestantism still prevails to a considerable extent. Consult *Mémoires et Comptes-rendus de la Société Scientifique et Littéraire d'Alais*.

ALAIS, PEACE OF. A treaty which ended the Huguenot wars in France. It was signed June 28, 1629, after the taking of Alais by the royal forces, La Rochelle having fallen by the policy of Richelieu the year before. By its terms the fortifications of the Protestant towns were razed and the Catholic worship reestablished in them, but amnesty and freedom of conscience were granted to the rebels.

ALAJUELA, ä'lä-hwä'lä. The capital of the province of Alajuela, Costa Rica, 13 miles west of San José, and a little on the western side of the watershed between the Atlantic and the Pacific (Map: Central America, E 5). The city is prosperous, because of the neighboring coffee, banana, and sugar plantations and the large cattle ranches. Here many of the insurrections against the republic had their rise, notably the daring attempt in 1824 of the Spaniard José Zamora to bring the State once more under Spanish rule. Pop., 1903, 4860; 1911 (est.), 6000.

ALA-KUL, ä'lä-kool' (Kirghiz, Turk., Mottled Lake). A lake of Russian Central Asia in the government of Semiryechensk, near the Russo-Chinese frontier, in 46° N. lat. and 82° E. long. It lies to the east of Lake Balkash at an elevation of 720 feet above sea level in one of the depressions forming breaches in the mountain barrier which separates the high tablelands of Central Asia from the lowlands to the west. It is about 35 miles long and 25 miles wide and has an area of 790 square miles. Its average depth is 15 feet. The lake is fed mainly by streams rising in the Tarbagatai Mountains to the north, but, as it has no outlet, its waters are salty, and therefore fish are scanty. The name is sometimes also applied to the smaller similar lake to the northwest, more properly called Sassyk-kul, which lies in the same depression and is connected with Ala-kul

by a strip of marshy land. It has an area of 200 square miles.

ALALONGA, ă'lă-lŭn'gă, or **ALILONGHI**, ă'lĭ-lŭn'gĭ. See TUNNY.

ALAM, ă-lăm', ABU'L HAJJAJ YUSUF IBN SULAIMAN AL SHANTAMARI (1019-83). An Arabian philologist. He was born in Santamaria, Spain, taught for many years at Córdoba, and died in Seville. He made a diwan, or collection of the best poems of the six foremost pre-Islamic poets (see ARABIC LANGUAGE AND LITERATURE) and wrote an excellent commentary on it. He also wrote a commentary to a part of Sibawaihi's grammatical work *Kitab*. The diwan was published by Ahlwardt, *The Divans of the Six Ancient Arabic Poets* (London, 1870). His commentary on Zuhair was published by Landberg, *Primeurs Arabes*, vol. ii (Leyden, 1889). Cf. Lyroff, *Zur Geschichte der Ueberlieferung des Zuhair-divans* (Munich, 1892), and Brockelmann, *Geschichte der arabischen Literatur*, i, 309 (Weimar, 1898).

ALAMAN, ă'lă-măn', LUCAS (1792-1853). An eminent Mexican statesman and historian. For a time he was a deputy of the colony in the Spanish Cortes, but in 1823, upon the downfall of Iturbide, returned to Mexico. As minister of domestic and foreign affairs under two successive administrations he developed industry, agriculture, and education. In 1834 he was director of the industrial commission appointed by Santa Anna, in whose dictatorial measures he subsequently (1853) took part. He wrote an extremely valuable *Historia de Méjico*, chiefly devoted to the nineteenth century (5 vols., 1849-52). His further publications include *Disertaciones sobre la Historia Mejicana* (1844-49).

AL'AMANCE, BATTLE OF. See REGULATORS.

AL'AMAN'NI. See ALEMANNI.

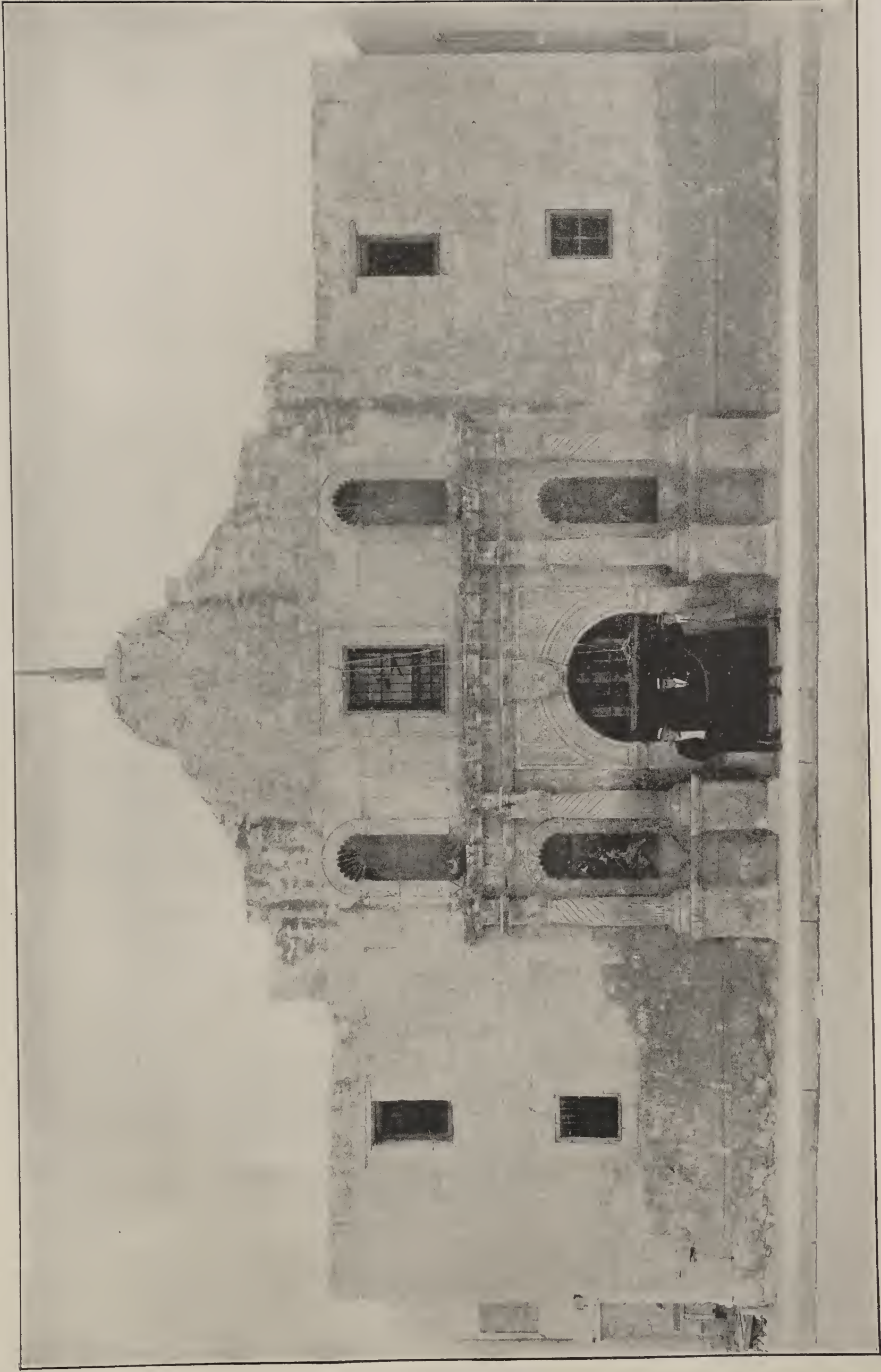
ALAMANNI, ă'lă-măn'nĕ, LUIGI (1495-1556). An Italian poet. He was born in Florence and, like Dante, was destined to spend his best years in exile. The Alamanni were zealous partisans of the Medici, whose favor Luigi himself enjoyed until some fancied grievance led him to conspire against the life of the Cardinal Giulio de' Medici, later Pope Clement VII. Being detected, he fled, and eventually took refuge at the French court, where he stood high in favor with Francis I and afterward with Henry II. Except for a brief interval, when Florence threw off the yoke of the Medici and he returned home to urge, unsuccessfully, that the republic should seek the protection of the Emperor Charles V, Alamanni spent the remainder of his life in France, and there most of his poems were written. His collected works include translations, epigrams, plays, *La coltivazione* (Paris, 1546), a didactic poem in imitation of Vergil's *Georgics*; *Opere toscane* (Lyons, 1533), vigorous satires which have been imitated in English by Sir Thomas Wyatt; and two long poems based upon the Arthurian romances: *Girone il Cortese* (Paris, 1548), in 24 cantos, and the *Avarchide*, in 25, the latter being in structure the story of the *Iliad*, freely adapted to fit the siege of Avarco (the modern Bruges) and chiefly interesting as marking the transition from the complicated adventures of Ariosto's *Orlando Furioso* to the classic unity of Tasso. Alamanni's *Versi c prose*, edited with a biography, by P. Raffaelli, was issued in two volumes (Florence, 1859). Consult Hauvette, *Luigi Alamanni, sa vie et son œuvre* (Paris, 1903).

ALAMEDA, ă'lă-mă'dă, or -mĕ'dă. A beautiful residential city in Alameda Co., Cal. It is 6 miles across the bay from San Francisco, with which it is connected by ferries, and is on the Southern Pacific, the Western Pacific, and the Santa Fe railroads (Map: California, C 5). On account of its fine sandy beaches, the city is a popular bathing resort. It has well-paved streets, a good sewage system, a Carnegie library, five public parks, well-equipped playgrounds, municipal baths, and notably good schools. Alameda is in a rich agricultural region, producing a large amount and great variety of fruit and vegetables. It is the home of a large packers' association and a motion-picture company. Among its manufactures are aëroplanes, motors, pumps, and engines. The electric light plant is owned and operated by the city, and a splendid system of street lighting has been adopted. Alameda was incorporated as a city in 1885, since which date its growth has been rapid. In 1913 the city voted to adopt the commission form of government. Pop., 1890, 11,165; 1900, 16,464; 1910, 23,383; 1913 (est.), 26,000.

ALAMINOS, ă'lă-mĕ'nōs, ANTON DE. A Spanish pilot, one of the first to take vessels to the North American coast. He was born at Palos de Moguer, Spain. He accompanied Columbus on his second voyage to the New World. During the second decade of the sixteenth century he conducted Ponce de León, Hernández de Córdoba, Francisco de Garay, and other voyagers who wished to reach the shores of the northern continent. In 1519 he was the first to take advantage of the current of the Gulf of Mexico. He is supposed to have been the author of the earliest detailed map of a part of what is now the United States, designed to show the limits of claims by discovery. This map was first printed by Navarrete, *Colección*, iii, 148 (Madrid, 1829).

ALAMO, ă'lă-mō, THE. A Franciscan mission built within the present San Antonio, Texas (q.v.), about 1722, and occasionally used after 1793 as a fort. It consisted of a church, an inclosed convent yard about 100 feet square, a convent and hospital building, and a plaza covering about 2½ acres, and protected by a wall 8 feet high and 33 inches thick. In 1836, during the war for Texan independence, a remarkable conflict occurred here between a small company of Texans and Americans including Col. David Crockett and Col. James Bowie, who held the fort under Col. W. B. Travis, and some Mexicans who attacked it under Santa Anna (q.v.). After a bombardment lasting almost continuously from February 23 to March 6, a small breach was made in the walls, and early on the morning of the 6th the Mexicans assaulted in force. They were twice driven back with great loss, but scaled the parapet in the third attempt, and a desperate hand-to-hand conflict ensued, in which the Texans, though already greatly weakened by privations and fatigue, fought with the utmost valor until only five of their number remained alive. These were captured and, on Santa Anna's order, were killed in cold blood. Three women, two children, and a negro boy alone survived out of a garrison which, including a reënforcement of 32 men that arrived on March 1, had numbered about 180. The Mexican loss was probably 500, though Santa Anna, in his untrustworthy report, gave it as 70 killed and 300 wounded. "Remember the Alamo!" became a

ALAMO



THE ALAMO, SAN ANTONIO, TEXAS

war-cry of the Texans, who finally defeated and captured Santa Anna at San Jacinto (q.v.). In allusion to the heroism shown by the garrison, Alamo has been called "the Thermopylae of America." In 1913 the city of San Antonio began to restore the Alamo. Consult: Williams, *Sam Houston and the War of Independence in Texas* (Boston, 1893); Potter, *The Fall of the Alamo* (Old South Leaflets); Zavala, *Story of the Siege and Fall of the Alamo* (San Antonio, 1911).

AL'AMOGOR'DO. A town and the county-seat of Otero Co., N. Mex., 86 miles north by east of El Paso, Texas, on the El Paso, Southwestern and the Alamogordo and Sacramento Mountain railroads (Map: New Mexico, F 3). It is the seat of the Southwestern Baptist College and of the New Mexico Institute for the Blind. Fruit-growing is an important industry of the surrounding region, and the town has an ice plant, stone and marble quarries, and copper, lead, zinc, and gold mines. Among the notable features of the town are the Marble and Alamo cañons, Queen of the Mist fountain, and Alameda Park. Pop., in 1913, about 2000.

ALAMOS, ä'lä-môs, or **REAL DE LOS** (rä-äl'dä lôs) **ALAMOS** (Sp., the poplars or sycamores). A town in the State of Sonora, Mexico, 125 miles northwest of Sinaloa (Map: Mexico, E 4). The town is unimportant, but the region has many lead and copper deposits. Pop., 1910, 5736.

ALAMO'SA. A city, and the county-seat of Conejos Co., Colo., 112 miles by rail south of Pueblo, on the Denver and Rio Grande Railroad, and on the Rio Grande (Map: Colorado, D 4). Alamosa has a Carnegie library, an opera house, railroad shops, and a flour mill. It is in an agricultural and stock-raising region, producing alfalfa, hay, sugar beets, small grain, and sheep. The water works and sewage system are owned by the municipality. Pop., 1890, 973; 1900, 1141; 1910, 3013.

ALAN, ä'an, WILLIAM. See ALLEN, WILLIAM.

AL'AN-A-DALE'. One of the companions of Robin Hood (see HOOD, ROBIN) in the old ballads and in Scott's *Ivanhoe*. In the former he is a light-hearted young man, much addicted to the "chanting" of roundelays, whom Robin assists to elope with his love.

ÅLAND ISLANDS, ö'län i'ländz, or ö'län. An archipelago consisting of one large island and many small islands and rocks, about 300 in all, in the government of Abo-Björneborg, Finland, at the entrance of the Gulf of Bothnia (Map: Russia, B 2). The strait separating them on the west from the Swedish coast at Grisslehamn is known as Aland Bay (Aland Haf). The largest of the islands which gives its name (signifying 'land of streams') to the whole group, has an area of 247 square miles; the area of the whole archipelago is 550 square miles. About 90 of the group are inhabited. Pop., 1897, 23,752. Although these rocky isles are covered with but a thin stratum of soil, they bear Scotch fir, spruce, and birch trees and with proper cultivation produce barley and oats, besides affording subsistence to a hardy breed of cattle. The inhabitants, of Swedish origin, are skillful sailors, fishermen, and seal-hunters. These islands belonged formerly to Sweden, but were seized by Russia in 1809. Previous to this they had several times changed hands between these two powers. In 1717 the Swedes were defeated by the Russians

in a naval engagement near Aland, the first important exploit of the Muscovite navy. The importance of these islands as a military position led to the construction, in the reign of the Emperor Nicholas I, of those strong fortifications at Bomarsund which, in August, 1854, were destroyed by the Anglo-French force, commanded by Sir Charles Napier and Baraguay d'Hilliers.

ALA'NI (Gk. 'Αλανοί, *Alanoi*). Nomadic tribes of Eastern origin who spread over Europe during the decline of the Roman Empire. They were first encountered by the Romans, apparently, when Pompey, in the Mithridatic War, led an expedition into the Caucasus. Nero, shortly before his death, planned an expedition against them; in Hadrian's time they threatened Cappadocia. In 276 A.D. they were checked by the Emperor Tacitus in their attempt to go eastward into Persia. The Huns gave them a severe defeat on the Tanaïs (now Don) toward the end of the third century (some writers put this defeat in 370), and then the Alani divided, some going east, but the larger portion joining their conquerors in an onslaught upon the Goths. With the Vandals and the Suevi the western Alani entered Gaul in 406 and later crossed the Pyrenees and founded settlements in Lusitania, where they lived for some time in peace. In 418 they were attacked by the Visigoths, their King was slain, and they became subject to Gunderic, King of the Vandals, losing completely their national independence. Later they served under the Visigothic King, Theodoric, but they sympathized with the Huns, and their desertion at Châlons (451) came near bringing defeat upon the Roman army. They were mentioned occasionally in later times. The eastern Alani seem to have kept their independence after the sixth century. In 1221 Genghis Khan defeated them, and they were so completely subjugated in 1237 by Batu Khan that their name disappeared from history. See *The Cambridge Mediæval History*, vol. i (New York, 1911).

AL-ARAF, ä'l-ä'räf. See ARAF.

ALARCON, ä'lär-kön', HERNANDO DE (1466-1540). A Spanish general, born at Palomares de Huete in 1466; he died in Naples, Jan. 17, 1540. As a youth in his teens he saw service at the sieges of Alhama, Loja, and Coín; and for his gallantry in the uprising at Guéjar he was called before the Commander-in-Chief, Count de La Tendilla, and publicly complimented. The *Gran Capitan*, Gonzalo de Córdoba, took him for service in the Neapolitan War. His conduct in Seminara, Terranova, Cephalonia, and elsewhere caused the King to confer upon him the title of "Señor." For a while he was Governor of Tarentum. After a brief period of rest in Spain (forced upon him by the King as a result of certain gallantries in Naples that were not in the field of military activities), he was returned to Italy in command of a Spanish army and served with great daring and ability at the battles of Ravenna (where he was wounded and captured) and Pavia. After this battle he was placed in charge of Francis I, whom he accompanied to Madrid. There he guarded his royal prisoner despite all efforts at bribery, in the historic Torre de los Lujanes. For his conduct at Pavia and while in charge of Francis I, the Emperor, Charles V, conferred upon him the title of Marqués de Valle Siciliana. The delicacy of his treatment of Francis I marked him as the

proper custodian of Pope Clement VII, after the assault and capture of Rome, in 1527. At the age of 70 he was called to the conquest of Tunis, which he effected in a brilliant campaign. For this service he was rewarded with the Vice-Royalty of Sicily, which he soon asked permission to resign so that he might retire to Castelnuovo. He fell ill and died shortly afterward. See Diona, *Capitanes Ilustres* (1851).

ALARCON, HERNANDO DE. A Spanish-American navigator, and the first European to ascend the Colorado River. On May 9, 1540, he sailed, with two vessels, from Acapulco, with instructions from the Viceroy Mendoza to cooperate with the expedition under Vasquez Coronado, which had gone in search of the Seven Cities of Cibolo, in what is now New Mexico. Alarcón sailed to the head of the Gulf of California and completed the explorations begun by Ulloa in the preceding year, by satisfying himself that there was no open water passage between the Gulf and the South Sea, or Pacific Ocean. Subsequently he entered the Colorado River, which he named the Buena Guia. With two small boats he ascended the river for a considerable distance, making important observations of the natives. On the second voyage he probably proceeded past the present site of Fort Yuma. He learned that Coronado had reached Cibolo, but was unable to communicate with him. A map drawn by Domingo del Castillo, one of Alarcón's pilots, in 1541, is the earliest detailed representation of the gulf and the lower course of the river, of which it gives a very accurate idea. It was first engraved for the Archbishop Lorenzana in 1770 and is given in facsimile by Winsor, *Narrative and Critical History of America* (Boston, 1886). Consult Winship, "Coronado," in *Reports of Bureau of Ethnology* (Washington, 1895).

ALARCON, PEDRO ANTONIO DE (1833-91). A modern Spanish novelist and statesman, born at Guadix, in Granada. He began his professional career as a journalist and published the *Eco de Occidente* of Granada, founded *La Redención*, and after the outbreak of the revolution in 1854 edited for a time a radical satirical paper, *El Látigo*. But he soon withdrew from participation in politics and began the series of short stories and essays which afterward were collected into numerous volumes, such as *Cosas que fueron* (1882); *Amores y amoríos* (1875); *Juicios literarios y artísticos* (1873). His share in the Morocco campaign of 1859 bore fruit in his *Diario de un testigo de la guerra de Africa* (1860), a chronicle noteworthy for its vivid picturesqueness and stirring patriotism. For many years after this he took an active part in national affairs and served successively as Deputy, member of the Council of State, Minister to Norway and Sweden, and Ambassador to the Porte. In 1875 he was elected a member of the Royal Spanish Academy. Of his many later novels, *El escándalo* (1875), written in defense of the Jesuits, made the greatest sensation at the time and led him to write other novels with religious themes; among which *La pródiga* (1882) was popular for a while. But their fame was transitory, and he will be much longer remembered for his less pretentious stories and sketches, his *Historiatus nacionales*, his *El sombrero de tres picos* (1874), and *El niño de la bola* (1880), studies of rustic manners, truly Spanish in their atmosphere, which show

Alarcón at his best. His last volume was a brief account of his works, *Historia de mis libros* (1889), a sort of literary testament. His complete works were published in a set of 19 volumes in 1899.

ALARCON Y MENDOZA, ä'lär-kön' ē mēn-dō'sà, DON JUAN RUÍZ DE (1581?-1639). One of the greatest of the Spanish dramatists of the Golden Age. Born at Tlach, Mexico, he left America in 1600 in order to study law at Salamanca. In 1608 he returned to Mexico in the hope that he might secure a chair at the university. But he failed to do so, and returned to Spain in 1611, where he entered the service of the Marqués de Salinas. His first play, *El semejante de sí mismo*, performed in 1613, was not successful, but it drew attention and hatred upon him, so that Cristóbal Suárez de Figueroa was not at all alone when, with brutally frank reference to Alarcón's physical infirmities, he called the latter "a monkey disguised as a man, an impudent hunchback, a grotesque cripple." Lope de Vega, Mendoza, and others flayed him, whereas Tirso de Molina was friendly to him and collaborated with him. In 1626 he became a member of the Council of the Indies. In 1628 he published a volume containing eight plays, and in 1634 a second volume containing additional plays. Alarcón was the least prolific of all the great dramatists of Spain. He wrote less than did the others, and many of his works circulated under the names of others. But Alarcón took the pains, as did none of his contemporaries, to mull over his plays and polish both their versification and their general composition. Hence his work is more evenly balanced than is theirs. He is unequalled in his creation of characters and in his lofty moral intentions, although he never descends to sermonizing. Fitzmaurice-Kelly says of Alarcón: "There are Spanish dramatists greater than Ruíz de Alarcón: there is none whose work shows such constant perfection. . . . Lope and Calderón have written better plays, and many that are worse: no verse of Alarcón is unworthy of him." His importance is not limited to Spanish literature, for on his *La verdad sospechosa* ('Truth Suspected'), Corneille confessedly modeled his own *Le menteur*, the first great comedy in modern French literature. Among his other plays may be mentioned *Las paredes oyen* ('Walls have ears'), *El examen de maridos* ('The Examination of Husbands'), *El tejedor de Segovia* ('The Weaver of Segovia'), and *Ganar amigos* ('Winning Friends'). The most available edition of his works is that by Hartzembusch in the *Biblioteca de autores españoles*, vol. xx (Madrid, 1852). Consult: Ticknor, *History of Spanish Literature* (Boston, 6th ed., 1888); Fitzmaurice-Kelly, *Littérature espagnole* (Paris, 1904); Fernández-Guerra y Orbe, *Don Juan Ruíz de Alarcón* (Madrid, 1871).

ALARD, á'lär', JEAN DELPHIN (1815-88). A French violinist. He was born at Bayonne, March 8, 1815, the son of an amateur violinist; studied in Paris under Habeneck and Fétis, and won the notice of Paganini when he appeared in concerts. In 1840 Alard succeeded Baillot as first violinist to the King, and in 1843 became professor of the violin at the Paris Conservatoire, a post he held until 1875. Sarasate (q.v.) was among his pupils. He was a representative of the modern French school of violin playing, composed nocturnes, duos, études, etc., for the violin, and was the author of an *Ecole*

du violon, which was adopted by the Conservatoire. He died in Paris, Feb. 22, 1888.

AL'ARIC (Goth., from *al*, all + *reiks*, ruler). The great chieftain of the Visigoths. He makes his first appearance in history in the struggle of the Goths against Theodosius (q.v.). In 394 A.D. he was leader of the Gothic auxiliaries of Theodosius in his war with the usurper Eugenius; but after the death of Theodosius he took advantage of the dissensions and weakness that prevailed in the Eastern Empire to invade (395) Thrace, Macedon, Thessaly, and Illyricum, devastating the country and threatening Constantinople itself. Rufinus, the Minister of Arcadius, appears to have sacrificed Greece in order to rescue the capital, and Athens was obliged to secure its own safety by ransom. Alaric proceeded to plunder and devastate Macedonia and Thessaly, but was interrupted by the landing of Stilicho (q.v.) in Elis with the troops of the West. Stilicho endeavored to hem in the Goths on the Peneus, but Alaric broke through his lines and escaped with his booty and prisoners to Illyricum, of which he was appointed governor by the Emperor, Arcadius (q.v.), who, frightened by his successes, hoped by conferring this dignity on him to make him a peaceful subject instead of a lawless enemy (396). In 401 he invaded Upper Italy; for the first time since the migration of the Teutones (q.v.) and the Cimbric barbarians now invaded Italy. Honorius, the Emperor of the West, fled from Rome to the more strongly fortified Ravenna. In 402 or 403 Alaric encountered Stilicho at Pollentia on the Tanarus; and soon after, the result of the battle of Verona forced him to retire into Illyricum. Through the mediation of Stilicho, Alaric concluded a treaty with Honorius (q.v.), according to which he was to advance into Epirus and thence attack Arcadius in conjunction with the troops of Stilicho. The projected expedition did not take place, yet Alaric demanded indemnification for having undertaken it, and Honorius, by the advice of Stilicho, promised him 4000 pounds of gold. When, after the death of Stilicho, Honorius failed to fulfill his promise, Alaric advanced with an army and invested Rome, which he refused to leave until he had obtained the promise of 5000 pounds of gold and 30,000 pounds of silver. But these negotiations, too, failed to produce any satisfactory result, and Alaric again besieged Rome (409 A.D.). Famine soon rendered it necessary that some arrangement should be made, and in order to do it the Senate proclaimed Priscus Attalus, the prefect of the city, emperor instead of Honorius. But Attalus displayed so little discretion that Alaric obliged him publicly to abdicate and renewed negotiations with Honorius. These also proved fruitless, and Alaric was so irritated at a perfidious attempt to fall upon him by surprise at Ravenna that he advanced on Rome for the third time. His victorious army entered the city Aug. 14, 410, and continued to pillage it for three days, though Alaric strictly forbade his soldiers to dishonor women or to destroy religious buildings. When Alaric quitted Rome, it was only to prosecute the conquest of Sicily and Africa, in order to gain control of their rich grain-lands. The occurrence of a storm, however, which his ill-constructed vessels were not able to resist, obliged him to abandon the project. He died, before the close of the year, at Consentia (Cosenza), in Bruttium. Legend

says that in order that his body might not be discovered by the Romans it was deposited in the bed of the river Busentinus, which was temporarily diverted from its course, and that the captives who had been employed in the work were put to death. Rome and all Italy celebrated the death of Alaric with public festivities. Consult: Hodgkin, *Italy and her Invaders* (Oxford, 1885); F. A. Gregorovius, *History of Rome in the Middle Ages*, Eng. trans., vol. i (New York, 1892); R. Lanciani, *The Destruction of Ancient Rome* (Boston, 1899); *The Cambridge Mediæval History*, vol. i (New York, 1911).

ALARIC II. King of the Visigoths, 485–507. He succeeded his father, Euric. He was of a peaceful disposition and wished to live on friendly terms with the Franks. His dominions were very extensive. Besides Hispania Tarraconensis and Bætica, he possessed numerous rich provinces in Gaul and formed an alliance, which still further increased his power, with Gondoband and Theodoric, the latter of whom was his father-in-law and King of the East Goths. At length, however, he came into collision with the Frankish monarch, Clovis (q.v.), whose cupidity had been excited by the extent and the fertility of the territories over which Alaric II ruled. An excuse for breaking the peace which existed between the two nations was found in the fact that Alaric II was a zealous Arian. This circumstance had given great offense to many of his subjects, who were orthodox Catholics; and ostensibly to vindicate the true doctrine, the newly converted barbarian Clovis declared war against him. The result was fatal to Alaric II. He was slain by the hand of Clovis himself at Vouillé, near Poitiers, and his forces routed. Alaric II is said to have been indolent and luxurious in his youth; but this may simply imply that he was not fond of those sanguinary pleasures which captivated his savage contemporaries. He was tolerant in his religious convictions. Though an Arian, he did not persecute the Catholics. He enacted several useful statutes and kept a watchful eye on all parts of his kingdom. It was during his reign that the *Breviarium Alaricianum*, or Breviary of Alaric (q.v.), was drawn up. It is a selection of imperial statutes and writings of the Roman juriconsults. Alaric II sent copies of it to all his governors, ordering them to use it exclusively. An edition of it was published by Hänel (Leipzig, 1849). Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

ALARIC COTTIN. Voltaire's nickname for Frederick the Great of Prussia, who was a great warrior, like Alaric, but a very indifferent poet, like the Abbé Catlin, a victim of Boileau's sarcasms.

ALARM' (Fr. *alarme*, It. *all'arme*, to arms, from Lat. pl. *arma*, arms). In military usage, a term which is not so important now as formerly. Originally an alarm was signified by the burning of a beacon, the ringing of a bell, beating of drums, or the firing of a gun. Now, in most instances, an alarm is transmitted by telegraph, telephone, signal lamps, and heliograph, among other devices. In military camps, army posts, or barracks there is generally an alarm or assembly post arranged, where the troops may assemble in response to calls of sudden emergency, such as fire, riot, or other unusual occurrence.

ALARM. A usually but not necessarily self-acting contrivance employed to call attention

to danger or accidents or to arouse persons from inattention or sleep. The common alarm-clock is a familiar example of such a device, and the electric burglar alarm is another. The simplest and most common arrangement of burglar alarm consists of an electric bell with wires leading to all parts of the windows, doors, and other parts of the building to be protected. The terminals of these wires are set in the framing of the windows and doors, so that if they are opened the action presses springs together and rings the bell in precisely the same way as by pressing the ordinary push-button. All special kinds of alarms for house protection consist of modifications in the method of making the contact suitable for special purposes, such as laying sheets of tin under the carpet to make contact with the wires when the carpet is stepped upon. Means are also generally introduced for indicating which window the signal comes from. This is done by leading the wires from each window separately through an annunciator, which shows through which wire, and consequently from which window, the signal came. The alarm will also sound if a window is carelessly left open. The entire alarm wiring of houses is also frequently connected with the police station by wire, so that it is notified of any tampering with the house in the absence of its occupant. Bank vaults and safes are also protected by numerous complicated mechanical and electrical devices which instantly give an alarm to watchmen or police officers of any disturbance due to tampering or attempted burglary. Automatic fire alarms are made in a variety of forms. A frequent arrangement consists of a string or a wire of very fusible metal supporting a weight whose fall sets in operation a train of mechanism which sounds a bell alarm. The weight is caused to fall by the burning or melting of the supporting string or wire. A rise in temperature by some device such as a thermostat or the operation of an automatic sprinkler system may also cause an alarm to be sounded at some central office. In factories and other buildings where there are many occupants fire alarms or gongs are usually required by statute to warn the workers, and this is supplemented by fire drills so as to enable them to leave the building without panic. (See FIRE ALARMS.) In steam boilers an alarm check valve, operating under the pressure of steam, is employed to give the alarm when the water-feeding apparatus ceases to work, or when the water falls below the point of safety. In many types of boilers a fusible plug is set into the crown sheet over the furnace; this plug remains intact as long as water covers such sheet, but melts should it become dry, allowing the steam to escape into the firebox and warn the engineer of the danger. Telegraph and telephone lines usually have some arrangement by which a break in the wires is indicated by a bell alarm. Railway lines have alarm-systems to notify engine-drivers or motormen that another train is on the section which they have just entered, or that a switch is set along. Fog bells, fog whistles, and whistling buoys are forms of alarms, and there are a great variety of other forms, such as alarm compasses, which are contrived to sound an alarm when the vessel deviates from its course; alarm funnels contrived to ring a bell when the liquid has reached a certain height in a cask which is being filled, and typewriter alarm bells which ring as the end of the line being written is approached.

AL'ARO'DIAN. A term derived from the Alarodii of the classical geographers and Herodotus, applied by Sayce and some other ethnographers and philologists to the linguistic stock represented especially by the Georgian among the numerous languages of the region of the Caucasus. The Alarodii dwelt about Mount Ararat and are supposed by some to be identical with the Urartu of the Assyrian inscriptions.

ALAS, à'läs, LEOPOLDO (1852-1901). A Spanish journalist and novelist, and professor of law at the University of Oviedo. As a critic, he was noted for his intolerance of pretense and mediocrity and for the fearlessness with which he spoke his mind regarding men of established reputation. As a novelist, he produced an unimportant work, *Su único hijo* (1891), a volume of short stories called *Pipá*, and one serious novel, *La regenta* (1884-85), an analytical study of criminal passion, revealing a rare subtlety of observation. He was the author of a drama, *Teresa*. His knowledge of European literature was extensive. In journalism he was best known under the pseudonym of "Clarín." He wrote also concerning law and economics: *Relaciones de la Moral con el Derecho* and *Programa de Economía*. He left also an unfinished novel, *Esperaindeo*, which is still inedited.

ALAS'CANS. A designation of foreign Protestants in London in the time of Edward VI from the name of John à Lasco (or Laski), a Polish reformer and refugee, who in 1550 was appointed by the King as superintendent of the foreign congregation there.

ALAS'CO. In Scott's *Kenilworth* (q.v.), an astrologer, also known as Dr. Demetrius Do-boobie, who aids the evil designs of Richard Varney against Amy Robsart.

ALASCO, ä-läs'kô, JOHANNES, or JAN LASKI (1499-1560). A Polish nobleman and traveler, born in Warsaw. He imbibed the doctrines of Zwingli at Zürich. He also knew Erasmus, who esteemed him highly, and in his will provided for the sale of his library to him. He returned to Poland, 1526, but left in 1536, on his declaration of Protestantism, and went to Frisia. There he preached Protestantism, but, anticipating persecution, he went to London, on Cranmer's invitation, and became superintendent of the congregation of the foreign Protestant exiles. On the accession of Mary, in 1553, he and all his congregation were banished. In 1556 he returned to Poland, where he died, at Pirchow, Jan. 13, 1560. He wrote many treatises and was one of the 18 divines who prepared the Polish version of the Bible. For his biography, consult H. Dalton (London, 1886).

ALASHEHR, ä-lä'shë'h'r (Turk. Mottled City). A city in the Turkish vilayet of Aidin, or Smyrna, lying 83 miles east by south of Smyrna, on the northern slope of Mount Tmolus (Map: Turkey in Asia, C 3). It is surrounded by a partly ruined wall and contains eight mosques and five Greek churches. Remains of ancient sculpture are to be found. Alashehr is connected by rail with Manissa and is the seat of a Greek archbishop. There is considerable trade, and mineral springs in the vicinity attract invalid visitors. The population is estimated at about 25,000. Alashehr was founded by Attalus Philadelphus, King of Pergamos, about 200 B.C., and is supposed to be one of the "seven churches of Asia" mentioned in the Apocalypse.

ALAS'KA. A Territory of the United States and its largest outlying possession, forming a

jutting land mass at the northwestern extremity of North America. According to the revised survey of 1906 its total area is 586,400 square miles. The territory ceded by Russia in 1867 (see *History*), and known up to that time as Russian America, was called Alaska by William H. Seward, this being a corruption of the Aleut word *alak'shak* or *al-ay'ek-sa*, meaning 'a great country or continent.' It is bounded on the north by the Arctic Ocean, on the west by the Arctic Ocean, Bering Strait, and Bering Sea, on the south and southwest by the Gulf of Alaska and the Pacific Ocean, and on the east by Canada (Yukon Territory and British Columbia). The eastern boundary from the Arctic Ocean to Mount St. Elias (a distance of 650 miles) is the 141st meridian; thence southeastward to Portland Canal it is a sinuous line (see *Boundary Dispute*) about 660 miles in length. Alaska extends from 129° 58' west to 172° 22' east longitude, and from 51° to 71° 25' north latitude. Approximately it falls between the same parallels as Scandinavia, and Juneau, its capital, is in about the latitude of Edinburgh. The meridian reached by the westernmost of the Aleutian Islands passes near the New Hebrides Islands and through New Zealand. Cape Prince of Wales, the most westerly point of the mainland, is nearly as far west as the Samoan Islands.

Topography. The main mass of Alaska is nearly rectangular, carved out from the continent by Mackenzie Bay on the north and the Gulf of Alaska on the south. An extension to the southeast is furnished by a panhandle—usually called Southeastern Alaska—and another to the southwest by the Alaska Peninsula and the Aleutian Islands. The latter, in conjunction with the Commander Islands of Siberia, form a broken barrier between Bering Sea and the Pacific Ocean. East of this, and parallel to it, lies the Kenai Peninsula, bounded by Cook Inlet on the west and Prince William Sound on the east. The Seward Peninsula extends westward from Central Alaska, and with the Chuckchee Peninsula of Siberia, from which it is separated by Bering Strait, only 54 miles wide, divides Bering Sea from the Arctic Ocean. The coast line of the territory is of two distinct types. Northward from the Alaska Peninsula shallow water conditions prevail, the coast line is regular, and the land slopes gently from the shore. Eastward and southward the shores are usually abrupt, deep water is found near the land, and there are many embayments and islands. The largest of these islands is Kodiak, which with adjacent islands forms a southwestern extension of the Kenai Peninsula. Southeastern Alaska embraces a narrow strip of mainland and the Alexander Archipelago, which fringes the coast for some 300 miles. The largest islands are Chichagof, Baranof, Admiralty, Prince of Wales, and Revillagigedo. The many straits, fiords, and canals of this part of the Territory, together with the rugged mountains of the mainland, have made its scenery world-famous.

Alaska is divisible into four geographic provinces, which named from south to north are: the Pacific Mountain system, the Central Plateau region, the Rocky Mountain system, and the Arctic slope region.

1. The Pacific Mountain system is a rugged highland belt 50 to 200 miles wide, skirting the southern shore line. It comprises four distinct ranges—the Coast, the St. Elias, the Aleutian, and the Alaska—and includes several large

basins, notably those of the Copper and Susitna rivers. The Coast Range stretches through southeastern Alaska. It is 5000 to 8000 feet in height and 50 to 80 miles in width. From its northern part many glaciers discharge into the sea. The St. Elias Range extends northwestward from Cross Sound, bends westward near the mouth of Copper River, and near the head of Prince William Sound (long. 147°) turns sharply southwestward and merges in the highlands of the Kenai Peninsula. Much of the seaward slope is covered by glacial ice. Near long. 142° the chain is parted by the valley of the Chitina River into divergent ranges. Of these the southern, called the Chugach Mountains (8000–10,000 feet high), continues the main range across the head of Prince William Sound, and the northern, called the Nutzotin Mountains (7000–10,000 feet high), stretches westward and forms a connecting link between the St. Elias and Alaskan ranges. Between these two forks is a group of volcanic peaks called the Wrangell Mountains, of which Mount Sanford (16,200 feet) is the highest. The St. Elias Range varies in width from 50 miles near Cross Sound to nearly 100 miles near Mount St. Elias, and then to less than 20 miles in the Kenai Peninsula. Near Cross Sound some peaks rise abruptly from tidewater to over 15,000 feet. Westward the range increases in height and complexity, culminating in Mount St. Elias (18,024 feet) and Mount Logan (19,540 feet). The former marks the international boundary, the latter lies in Canadian territory. The Aleutian Range forms the backbone of the Alaska Peninsula. It rises directly from the sea near the southwestern extremity of the peninsula and skirts the Pacific shore as far as the entrance to Cook Inlet. At this point a broad lowland intervenes and throws the axis to the west; the range (here sometimes called the Chigmit Mountains) continues northward to about lat. 61°, and there falls off abruptly to a lowland. The range is widest near lat. 58°, northward from which it rapidly narrows. The Alaska Range extends northeastward from the vicinity of Lake Clark and sweeps around the great Susitna and Copper river basins, formerly the watershed between the Pacific drainage on the south and east and the Kuskokwim and Yukon waters on the north and west. It averages 50 to 60 miles in width. Its southern end has been little explored, but probably has no peaks higher than 5000 or 6000 feet. Toward the north the relief increases: Mount Spurr measures 10,500 feet, Mount Russell 11,300 feet, and Mount Dall 9000 feet. Mount McKinley (lat. 62° 30'), according to measurements taken by the U. S. Coast and Geodetic Survey, reaches 20,300 feet, the highest on the continent; and Mount Foraker, 14 miles to the south, 17,000 feet. These two, though visible from Cook Inlet and known to whites for more than 100 years, were not indicated on maps until 1898. Mount McKinley was known to Russians as *Bulshaia* and to the natives of Cook Inlet as *Traleika*. Both names signify 'high' or 'big mountain.' The natives of the interior know it as *Denali*. In 1895 it was named Mount McKinley by W. A. Dickey, who ascended the Susitna River and said it was at least 20,000 feet high. In 1898 George H. Eldredge and Robert Muldrow, of the United States Geological Survey, determined its position and altitude, which was later revised as above; and the following year Lieut. Joseph S. Herron, U. S. A., named the second high peak Mount Foraker. In

1902 a more extended exploration of the range was made by Alfred H. Brooks and D. L. Reaburn, of the United States Geological Survey, who were the first white men to reach the base of Mount McKinley. A number of attempts to ascend it were made. In 1912 Professor Herschel Parker of Columbia University and Mr. Belmore Browne of New York got within three or four hundred feet of the summit. In 1913 Rev. Hudson Stuck, Archdeacon of the Yukon, with Mr. H. P. Karstens and two others, reached the top. The eastern end of the Alaskan Range is of lesser altitude, Mount Hayes (13,800 feet) and Mount Kimball (9680 feet) being the highest peaks.

2. East and north of the Pacific Mountains is the Central Plateau region, 200 miles wide, corresponding with the Great Basin region of the western United States. Though formerly a plateau, this region has changed in character. The rivers have trenched broad channels through it, giving it the appearance of a rolling upland with summits of uniform level. The plain of these summits is 4000 feet at the international boundary and falls off gradually to 1000 feet near Bering Sea.

3. The Rocky Mountain system of North America continues northwestward nearly to the Arctic Ocean, then turns almost at right angles, crosses the international boundary in about lat. 68°, and stretches across northern Alaska, finally dying out before it reaches the Arctic Ocean. It enters Alaska as a mountainous belt over 100 miles wide, consisting of several more or less distinct ranges separated by broad, low gaps and containing peaks 7000 to 8000 feet high. The western extension, known as the Endicott Mountains, is little known, but appears to comprise two or more ranges 4000 to 6000 feet in height.

4. The Arctic Slope region begins as a slightly elevated plateau, dissected and more or less rolling, which slopes to the north from the foothills of the Rocky Mountains. This plateau terminates abruptly in a scarp, from which a featureless coastal plain, of varying width, stretches to the Arctic Ocean.

About one-fifth of the drainage of Alaska is toward the Pacific Ocean, nearly one-half toward Bering Sea, and the rest toward the Arctic Ocean. The Pacific drainage embraces two classes of rivers: first, those which rise among the coastal mountains; and second, those which traverse the mountains on their way to the sea. Of the first the Susitna and Copper, and of the second the Alsek, Taku, and Stikine are the most prominent examples. The Yukon (fifth in size of North American rivers) is the master stream, and its basin practically comprises the Central Plateau province. With its longest tributary (the Yukon is formed by the union of the Pelly and Lewes) it is about 2400 miles in length, and its discharge at low water is about 500,000 cubic feet per second. Other chief tributaries of the Yukon are the White, the Porcupine, the Tanana, and the Koyukuk. The headwaters of the Lewes are but 25 miles from the coast at Lynn Canal. Two passes, the Chilkoot (3100 feet) and the White (2800 feet), break the Coast Range at the head of Lynn Canal and afford routes into the interior, which were used by thousands of gold-seekers during the Klondike excitement of 1897 and 1898. A railway over the White Pass now connects tidewater with navigable waters on the Lewes River. The Kuskokwim River, second in size to the Yukon, empties into Bering Sea. Its length is about 1200 miles, and it has many

unexplored tributaries. The Arctic drainage includes the Selawik, Kobuk, and Noatak rivers, flowing westward into Kotzebue Sound; and the Meade, Chipp, and Colville rivers, flowing northward into the Arctic Ocean.

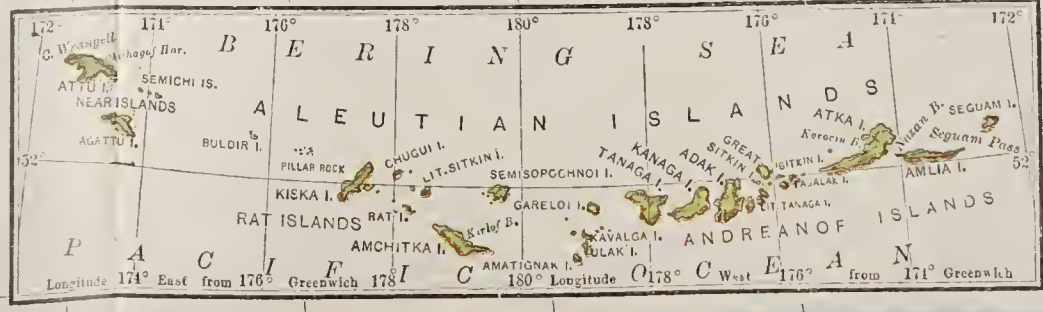
Climate. The range of climate in Alaska is greater than that from Florida to Maine. Only the northern third of the Territory can be said to have a distinctly arctic climate, while the southern seaboard is made comparatively temperate by the warm waters and winds of the Pacific. The records at Sitka in southeastern Alaska show for August, the hottest month, a range of 35° to 87° F.; and for February, the coldest month, a range of 3° to 54° F. The mean annual temperature is 43° F., about the same as that of Christiania, Norway. At Fort Tongass, the extreme southeastern point of the Territory, the records indicate a mean annual temperature of 48°. In southeastern Alaska frosts occur from October to April. The snowfall is light at sea level, but heavy in the mountains. The moist winds of the Pacific precipitate their waters along the coastal zone in a rainfall varying from about 130 inches at Fort Tongass to 84 inches at Juneau. April and July are the driest months. Between Cross Sound and Cook Inlet the rainfall is about the same, as is also the mean annual temperature. Though few climatic observations have been made in the Copper River basin, it is known to be drier and colder than on the coast. Extreme temperatures of 94° F. in August, and -53° F. in December have been recorded. The snowfall is 2 to 4 feet. Frosts occur throughout the year, but are rare in June, July, and the early part of August. Valdes on Prince William Sound has a summer temperature 5° colder and a winter temperature 10° colder than Sitka, and probably 50 per cent less rainfall, with a snowfall of about 12 feet. Cook Inlet and the adjacent region to the north have bright, clear weather in summer and cold winters. The extremes of temperature at Kenai (east side of Cook inlet) are 82° F. in July and -43° F. in December with a precipitation of about 17 inches. The Alaska Peninsula and Aleutian Island region has a climate similar to that of northern Scotland, with a rainfall varying from 24 to 48 inches and a mean annual temperature of about 40°. The Bering Sea coastal province has a rainfall varying from 33 inches at Bristol Bay to 18 inches at St. Michael. At St. Michael the mean annual temperature is 26°, and frosts occur from September to June. The northern half of Bering Sea is frozen from November until April, but St. Michael harbor is closed from the end of September until the middle of June. At Nome and in the Seward Peninsula June and July are often dry and clear, but the rains usually begin in the middle of August, often accompanied by high winds, and stormy weather prevails until snow comes early in October. The Arctic Coast of Alaska has a precipitation of about 8 inches. The extremes of temperature are -55° F. and 80° F.; the mean is less than 8° F. The Arctic Ocean is usually locked in ice from early in September until July. The climate of the interior is continental in character: semi-arid with great extremes of heat and cold. From Bering Sea inland the humidity gradually decreases, until at the international boundary the annual precipitation is less than 12 inches. Here extremes of temperature of 90° F. in summer and -76°

ALASKA

SCALE OF STATUTE MILES

SCALE OF KILOMETERS

Important towns are shown in heavy face type
Railroads shown thus



F. in winter have been recorded. The mean annual temperature at Eagle is about 21° F. Frosts occur throughout the year, but are rare between the middle of June and the middle of July. Snowfall aggregates 2 to 3 feet. The Yukon breaks about the middle of May and closes early in November, but on account of running ice is usually navigable only from June 1 to September 20.

Fauna. Among the large animals of Alaska the most important are bear, moose, caribou, sheep, goats, and deer. Deer are found in abundance in southeastern Alaska and the adjacent islands, but not elsewhere. Goats occur only in the higher ranges of the Pacific seaboard, but the white sheep (bighorn) is found throughout the higher parts of the midland mountain systems and on Kenai Peninsula. At least two varieties of the caribou are met with: the larger, called the woodland caribou, is abundant in the timbered regions of the interior; while the smaller, known as the wild reindeer, or barren ground caribou, meanders in large herds over the timberless northern areas and is also found on the Alaska Peninsula. Moose, though formerly abundant in the timbered valleys, are becoming scarce in some localities visited by white men. Black bear are widely distributed in the coast and inland regions, but are not found in the barren grounds. The true grizzly probably occurs only in the coastal strip of the Panhandle and in the Upper Yukon basin. There are many varieties of brown bear, the largest of which is the so-called Kodiak bear, which is found on the island of the same name. A closely allied variety, the Alaska brown bear, is found on adjacent parts of the mainland. Smaller varieties are found in the barren grounds. The white polar bear is indigenous only in the extreme north, but occasionally one is carried through the straits into Bering Sea. Of the smaller fur-bearing animals there are wolves, wolverines, foxes, beavers, muskrats, otters, mink, weasels, and sable (ermine). Many of the birds of the temperate zone are found in Alaska during the summer months. The ptarmigan occurs throughout the Territory, and the raven and eagle are plentiful in southeastern Alaska. Reptiles and amphibians are scarce, but there is a great variety of insect life, among which the mosquito is most conspicuous throughout the Territory. The marine mammals include whales (several varieties), porpoises, walrus, sea lion, hair and fur seal, and sea otter; but the last-named is nearly extinct. Fish occur in great variety and abundance. The salmon, white fish, and Arctic trout are the most plentiful and widely distributed.

Flora. In the distribution of vegetable life five broad zones can be recognized: (1) the Pacific coastal forests, (2) the southeastern grass lands, (3) the inland woodland, (4) the tundra, or barren grounds, (5) the alpine zone of the high ranges.

The Pacific coastal forests in the southeast include a luxuriant vegetation with much merchantable timber. The soil covering is chiefly moss, but in some flats grass and wild flowers are also found as far to the northwest as Kodiak Island, where the type is more stunted. Hemlock and Sitka spruce are the dominating varieties of trees. Of the deciduous trees, cottonwood, alder, and willow are most abundant. The devil's club, typical of the coastal region, occurs as far west as Cook Inlet, and up the Copper River as far as

Wood's Canyon. The lower Copper River valley is without timber except for some groves of cottonwood. Valuable red cedar is found as far north as Sitka, and the more plentiful yellow cedar as far as Yakutat Bay. The tree line stands at about 3000 to 3500 at Dixon Entrance, and decreases to 500 or 1500 feet on Prince William Sound. Timber is used locally for structural purposes and for making boxes for canned salmon and halibut. There are also large reserves of timber which could be utilized for pulp. Southeastern Alaska has been set aside as the Tongass National Forest, and contains valuable timber reserves. The Chugach National Forest includes an area stretching from Controller Bay to Cook Inlet.

The grass lands of the timberless southwest include the Alaska Peninsula, most of Kodiak Island, and the Aleutian Chain, forming the second province. Grass grows abundantly up to an altitude of 1000 to 2000 feet, above which the vegetation merges into the lichen and moss type of the alpine vegetation zone. This province includes some good grazing lands. Those on Kodiak Island have been used for stock for upwards of a century.

The inland woodland type of vegetation is in most places sharply separated from the coastal forests by a high mountain barrier. At Skagway, on Lynn Canal, and at the head of Cook Inlet, however, there is a mingling of the coast and inland species.

Spruce (black and white) predominates in the interior, but poplar, aspen, white birch, and alder are also common. In the lower Tanana valley tamarack has been found. Near the international boundary the timber line is about 3000 feet above the sea, but along the northern tributaries of the Yukon and the rivers flowing into Kotzebue Sound falls to less than 1000 feet. Heavy forest growth is confined to the valley floors, often to a narrow fringe along the water courses. On the Yukon and some of its larger tributaries spruce trees 2 feet or more at the butt are occasionally found, but as a rule the maximum diameter is 16 to 18 inches. The interior forests, if preserved, will amply supply local use for many years, but the arid conditions and the carelessness of both natives and whites have caused much destruction by forest fires. The fourth province, the tundra, embraces the coastal region northward from the Aleutian Islands to Point Barrow and eastward to the international boundary. The surface is covered with moss and herbaceous plants, with a little fine shrubbery, and fringes of stunted willow along the water courses. The only break in this treeless belt is on the north shore of Norton Sound, where some spruce forests occur. The alpine vegetation zone embraces the upper reaches of the high ranges. Its lower part is characterized by stunted shrubbery, grass, and many flowering plants, merging at higher altitudes into moss and, finally, still higher, into lichens. Throughout Alaska the abundance and variety of wild flowers are striking. Many of these are kindred to species common in the United States. Grasses are very abundant in the Cook Inlet, Copper River, and Yukon River regions, and are also found in sheltered parts of the tundra region.

Geology and Mineral Resources. Some gneisses and schists (Archean?) which occur in the Yukon basin are the oldest rocks of Alaska. The next higher horizon embraces a great com-

plex of altered sediments with many igneous rocks, which are in part Ordovician, Silurian, and Devonian. These form a broad belt stretching between the Yukon and the Tanana, and the same terrain is probably represented in the Seward Peninsula and in the Panhandle. Devonian, Carboniferous, Triassic, Jurassic, and Cretaceous beds have been found widely distributed. The Tertiary is represented by coal-bearing beds which occur in the Pacific, interior, and Arctic provinces. Extensive sheets of recent gravels, sands, and silts mantle much of the Territory. The Coast Range of southeastern Alaska is made up almost entirely of granite and related igneous rocks. Extensive volcanic ejecta occur in the Copper River basin, the Alaska Peninsula, and the Aleutian Islands. There are active volcanoes in all three of these districts. The mountain ranges throughout Alaska are the results of erosion in areas of very recent uplift. During the glacial period the Panhandle, with the exception of some of the higher peaks, was buried in ice, which channeled out the valleys now remaining as fiords. The same ice cap stretched inland over the Coast Range and extended northwestward down the valleys of the tributaries of the Yukon to about lat. 62°. During this period the St. Elias, Alaska, Aleutian, and Endicott mountains were centres of ice accumulation, which did not, however, extend far into the adjacent lowlands. The fast-disappearing remnants of these former ice sheets are the glaciers of the Pacific ranges. During the maximum extension of the ice it covered less than one-fifth of Alaska. The areas now covered by ice and perpetual snow aggregate less than 20,000 square miles. The developed mineral resources include gold (placer and lode), silver, lead, copper, tin, coal, gypsum, marble, and mineral water. Of prospective value are the deposits of zinc, iron, and possibly petroleum and mercury. The highly altered rocks of the Panhandle are the locus of most of the auriferous lode mining and also contain some placer gold, silver, and copper. This belt appears to be continued in the Prince William Sound and Kenai Peninsula region, where it carries gold and copper. The inland placer-bearing districts (including Forty Mile, Fairbanks, etc.) lie in another belt of highly altered rocks, which also appears to crop out in the Seward Peninsula, where rich placers have been found. Copper-bearing rocks occur both on the north and south slopes of the Wrangell Mountains. The coal-bearing rocks of Alaska cover at least 20,000 square miles. Coal has been found in four different horizons: in the Carboniferous and Jurassic near Cape Lisburne, and in the Cretaceous and Tertiary of the Yukon and Pacific coast regions. The last is the most important, and near Controller Bay and in the Matanuska valley has yielded high-grade bituminous and semi-anthracite coals. Lignite coals are very widely distributed. Marble, gypsum, and mineral waters have been found in commercial quantities in the Panhandle, where iron, zinc, and lead deposits are also known to occur. Petroleum seepages occur at several places along the seaboard between Controller Bay and Cook Inlet. Tin (cassiterite) is found near Cape Prince of Wales and on the lower Tanana, and mercury (cinnabar) in the Kuskokwim basin.

Mining. Though the Russians knew that both gold and copper occurred in Alaska, they made no effort to develop it. Their only attempt at mining was to open up a coal deposit on Cook

Inlet in 1854. Gold was found at Sitka in 1876, but it was first mined extensively at Juneau, where it was discovered in 1880. Placer gold in the interior was first found on Forty Mile River in 1886, and this was followed by the discovery of the Birch Creek and Rampart districts in 1893. The annual output of gold from the inland region rose slowly, until by 1895 it amounted to \$800,000; the mining population was then about 1600 men. Meanwhile the coastal region had made steady progress: by 1888 the Treadwell mine on Douglas Island, near Juneau, had become one of the great gold-producers of the world, while a number of smaller mines in the vicinity were developed. The Apollo mine on Unga Island in southeastern Alaska was opened in 1886, and the Cook Inlet placer fields were discovered in 1894. It was the discovery of the Klondike gold placers (1896), close to the international boundary but on the Canadian side, which first attracted large numbers of prospectors to Alaska; but no important discoveries of mineral wealth were made in Alaskan territory until 1899, when the Nome placers were found. The gold production of that year, about \$6,000,000, was nearly double that of 1898. Since 1899 many new gold-bearing areas have been discovered, and marked progress has been made in the placer-mining industry. The Fairbanks district on the Tanana was discovered in 1902, and in 1905 yielded nearly \$6,000,000.

In 1906-07 important new discoveries of placer mines were made in this district, and in 1909 new and valuable quartz veins bearing gold were found in the same region. Placer mining continued to furnish by far the larger portion of the gold produced. During these years a remarkable feature of mining in Alaska was the large quantities of gold found in the sands of the beaches of Cook Inlet and other bodies of water. In 1909-10 a discovery of gold in the waters of Otter Creek, the northern tributary of the Haiditarod or Iditarod River resulted in a rush of prospectors to that region, which is in the Innoko valley. The production from this field increased from \$825,000 in 1910 to about \$3,000,000 in 1912. The gold production of the Territory in recent years has been remarkably constant. In 1910 it was \$16,126,749, in 1911 \$16,853,256, and in 1912 \$17,145,951. Of the production in 1912 \$11,990,000 came from the placer mines, but the tendency is for the relative output from the deep mines to increase. The Fairbanks camp leads all other camps in production, but the output from this camp decreased from \$6,100,000 in 1910 to \$4,100,000 in 1912.

The silver production, chiefly incidental to gold mining, was 515,186 fine ounces in 1912, valued at \$316,839, compared with 460,231 ounces in 1911 and 157,850 ounces in 1910.

The mining of copper promises to be one of the leading mineral industries of the Territory. Copper mining began in 1901 at Prince William Sound, and operations were later extended to Prince of Wales Island. Two smelters were erected here, but have not been operated for several years. The output was not large—in 1905, 30,000 tons, valued at \$700,000. Prospecting had for many years been carried on in the Copper Mine district, and large bodies of ore had been found. It was not until 1911, however, that copper was actually produced in this region. In 1911 the copper production of the Territory

was 22,314,889 pounds compared with 4,311,026 in 1910. The increase was due to the production from the Bonanza mine in the Copper River district. The output in 1912 was 29,230,491 pounds, valued at \$4,823,031.

Placer tin has been mined in the York district of the Seward Peninsula since 1902, and there has been a small amount of lode tin mining in the same district.

The existence of vast fields of coal in Alaska had been known for many years. In 1896 large deposits were found in the valleys of the Matanuska and Bering rivers. The coal in these fields is anthracite and high-grade bituminous, but much is too crushed to yield a high percentage of lump; and its value for steaming is still mooted. The Bering River field covers about 50 sq. miles, or 32,000 acres. It lies approximately 25 miles from the coast of Controller Bay, the nearest tide-water and about 90 miles from Cordova, the nearest good harbor. The Matanuska field is larger, covering about 74 sq. miles, or 47,360 acres. It is north of Prince William Sound and from 150 to 200 miles from Seward or Resurrection Bay. The coal in the other fields of the Territory, so far discovered, is lignite and low-grade bituminous.

The development of the coal fields of Alaska has been retarded by the lack of transportation facilities (see *Transportation*), and by controversies over the proper administration of the coal lands. (See *History*.) In 1911 only one mine, that of the Chignik Coal Mining Company near Chignik Bay, was operated commercially, and the estimated output of the Territory was only 900 tons. In the fiscal year of 1913, 102,169 tons, valued at \$492,301, were imported.

Petroleum has been found in the Katalles field east of the Copper River, but the production as yet has been small. An executive order of Nov. 3, 1910, withdrew unlocated oil lands from entry. Gypsum is found in Chicagof Island. Marble of various colors is quarried on Prince of Wales and other islands of southeastern Alaska. Antimony, graphite, bismuth, cinnabar, and talc have been found, but not in sufficient quantities to justify their commercial exploitation.

The total value of all mineral products in 1912 was \$22,537,821, as compared with \$20,650,000 in 1911.

Some of the defects in the placer-mining laws as applied to Alaska were remedied by the Sixty-second Congress in 1911. The measures passed were designed to mitigate two evils which have hindered the development of placer mining—the unlimited power of attorney, and the association claims. By this enactment no association placer-mining claim in excess of 40 acres may be issued in Alaska. The provision in regard to the power of attorney restricts the number of such powers to two for any one person in any one month.

Fisheries. Fish have always been an important source of food supply for the natives, among whom the salmon, white fish, tomcod, and inconnu fish are most used. The most important of the fisheries are the salmon, cod, halibut, herring, and whale. Whaling, begun about 1840, is the oldest of the fishing industries, but is now on the decline. The catch of the whaling fleet from 1874 to 1900 was valued at about \$11,200,000. The first salmon cannery was established on the Alaskan coast in 1878. There are many species of salmon, of which the king (the largest), silver, red, and hump-

back are the most important. They are very widely distributed, being found along the entire Alaskan coast, but are caught only at the mouths of the streams which they ascend during spawning season. Bristol Bay is the most important salmon-canning centre, but there are several others along the coast southward as far as the boundary.

In 1907 the mild curing of king salmon was begun and proved to be very profitable. The total output of canned salmon in 1912 was the greatest in the history of the industry. There were about 3,900,000 cases of four dozen one-pound cans each, compared with 2,823,817 cases, in 1911. In 1912 there were 87 salmon canneries in operation, compared with 64 in 1911. The total investment in the fisheries of Alaska in 1912 was \$37,549,740, about 90 per cent of which was in salmon fishing. In the several branches of fishing, 24,263 persons were employed, an increase of 6,311 over 1911. The finished product in all branches of fishing for 1912 was valued at \$18,877,468. For several years the United States Bureau of Fisheries has carried on successful experiments in hatching salmon fry for restocking the streams.

The decline of whale fishing is noted above. In 1907 a plant for extracting oil and making guano from whales was established at Tyrell on Admiralty Island. This was operated successfully for several years. But next to the salmon the most important fisheries are those of halibut, cod, and herring. Cod banks are scattered along the entire coast line as far north as the southern part of Bering Sea. Halibut are very abundant along the Pacific shore. The total production of halibut in 1912 was 17,146,743 pounds. Immense shoals of herring visit the bays and estuaries, and a small but thriving industry has grown up in the conversion of herring into oil and fertilizer. This practice is being attacked.

Agriculture. Alaska has probably 15,000 to 30,000 square miles of arable lands: as much as the agricultural land of Finland, a country which not only supports a population of 2,500,000, but exports butter, cheese, grain, and live stock. Because of the high cost of labor, Alaska can support only small farms, but these can be made to yield an ample return because of the abundant local market. In 1903 the homestead law was extended to Alaska and modified to permit the acquiring of 320 acres for agricultural purposes. There being no public land surveys, each homesteader has to make surveys at his own expense, with the result that but little land has been taken up. Since 1910, much of the more accessible arable land has been covered by sub-divisional surveys. Climate and location make southeastern Alaska the most favorable for agriculture, but the heavy forest growth entails an almost prohibitive cost for clearing the land in anything except small patches. Moreover, much of this region is too rugged for the purpose. At Sitka wheat, barley, rye, oats, and a great variety of vegetables, together with strawberries, gooseberries, raspberries, and currants, have been successfully raised. The growing season is from May to October. In general the same conditions prevail to the westward as far as Cook Inlet, though the climate is somewhat colder. The region adjacent to Cook Inlet and the Susitna valley is the most promising for agriculture. Here the abundance of native grasses is evidence of a soil suitable for hay; wheat, barley, oats.

buckwheat, clover, potatoes, and many vegetables have been successfully matured. The growing season extends only from about the first of June until September, but the long days and almost continuous sunshine mature plants very rapidly. On the Alaska Peninsula and adjacent islands the abundance of good grass will undoubtedly mark this for a stock-raising region. The Copper River district also contains good grass country, and barley, oats, and rye, as well as many vegetables have been matured. In favorable localities in the Yukon valley, vegetables have been extensively raised for local use. Oats, rye, wheat, and barley have been raised at Rampart and Fairbanks. The Tanana valley is the most favorable part of the interior for agriculture. Near Fairbanks are a number of prosperous ranches. Hardy vegetables have been matured in the Koyukuk valley north of the Arctic Circle. Grass grows luxuriantly throughout the Yukon basin. The growing season is confined to two or three months in summer, but this is partly compensated for by the length of the Arctic summer day.

The United States Department of Agriculture has established agricultural experiment stations in Alaska, and the results obtained indicate that certain sections of the Territory have great possibilities for the raising of some varieties of grain, vegetables, and fruit. It has been proved that while at present growing of wheat, except in an experimental way, is hardly feasible, a considerable portion of the Territory is adapted to raising barley and oats. At an agricultural fair held at Fairbanks in May, 1911, a great variety of native farm products were shown. These experiment stations have shown, also, that garden vegetables can be successfully grown in Alaska. In 1911, as the result of the increase in farming, the shipment of potatoes from the States was smaller by 25,149 bushels than in 1910; of hay, by 2155 tons; of beans and peas, by 7322 bushels; and of onions, by 964 bushels. Experiments in the growth of a hybrid strawberry, by crossing several cultivated varieties with the wild strawberry of the Alaska coast, have been successful.

A station for the breeding of sheep and cattle is maintained on Kodiak Island. This has met with signal success, but the grazing grounds where the station is situated were badly damaged by a heavy fall of volcanic ashes in 1912. The luxuriant growth of grasses in the territory surrounding Cook Inlet, and in other regions where the climate is comparatively mild, induces the belief among agricultural experts that stock-raising will become in time a profitable industry. The grazing area of the Territory is of large extent.

In 1910 the farms in the Territory numbered 222, with an area of 42,544 acres, of which 2660 acres were improved. The farm property was valued at \$1,468,402. Vegetables were the most important agricultural product, and their value in 1909 was \$186,134; the value of hay and forage was \$94,993.

Furs. The fur trade first attracted the Russians to Alaska and continued to be the leading industry until the development of the gold mines. The most valuable fur-bearing animal is the sea otter, formerly numerous along the entire Pacific coast, but now found only on some of the Aleutian Islands and threatened with extermination. The killing of the sea otter is now prohibited by law. It is estimated

that during the Russian occupation 260,800 sea otter skins were taken, valued at \$26,000,000. Since 1867 about 90,000 sea otter skins have been marketed, but the present annual output is probably less than a score. Good skins are worth from \$800 to \$1200 in the London market. The fur-seal industry, though developed by the Russians, reached its greatest expansion after the transfer of the Territory. It is estimated that from 1745 to 1867, 3,350,000 fur seals were taken. From 1867 to 1902 2,524,082 skins to the value of \$35,000,000 were exported. The fur seal, though during part of the year widely distributed in the northern Pacific and Bering Sea, has only one breeding ground in Alaska, on the Pribilof Islands (lat. 57° N., long. 170° W.), where most of the skins have been taken. In 1870 the capture of seals on these islands, except by government permit, was prohibited by law.

Before April 30, 1910, they were leased by the United States government to companies which had the right to take the fur seals found there. On the expiration of these leases, on the date given above, the United States took sole charge of the islands and the fisheries. The seals had been reduced to such a number that their practical extinction would have been a matter of a few years only, if conditions then prevailing had been maintained. This had come about chiefly because of the practice of "pelagic sealing," which is the killing of seals at sea, outside the three-mile limit. The countries whose fishermen were engaged in this were the United States, Great Britain, Russia, and Japan. The American authorities had for years endeavored to prevent this practice, but with little success. In "pelagic sealing" seals of all ages and both sexes are indiscriminately slaughtered, and the breeding of seals is thereby prevented. To bring an end to this economic waste, which meant the ultimate destruction of all the herds, the United States arranged a conference between the nations concerned. This was known as the International Fur Seal Conference, and it was in session in poaching time from May 11 to July 7, 1911.

As a result of their deliberations it was agreed that "pelagic sealing" should be abandoned for 15 years, and that the terms of the agreement should continue in force after that time unless terminated by a written notice given by one or more of the parties to all the others 12 months in advance. As compensation for this concession the United States agreed to share with the other governments in the profits received from the fisheries on the Pribilof Islands. This convention was ratified and went into effect Dec. 15, 1911. In 1912 the United States Congress passed a measure providing for a close season for five years from 1913 in the Pribilof Islands. Natives in the islands are permitted to kill annually a sufficient number of male seals to provide food and clothing. An actual census of the Pribilof herd in 1912 revealed 215,940 seals of all classes. The provisions of this measure, as well as those of the conference, apply also to the sea otter.

An important measure relating to fur-bearing animals and seals was passed by Congress in 1908. This enactment gives to the Secretary of Commerce and Labor, now the Secretary of Commerce, practical supervision over the fur-sealing industry on the Pribilof Islands. The act also provided that no person shall kill any

otter, mink, martin, sable, fur seal, or other fur-bearing animal in Alaska, except under such regulations as are prescribed by the Secretary. Fur-bearing animals enumerated below may be hunted and killed in the Territory, except during the season specified with respect to each of them.

Sea otter. The hunting or killing of sea otter is prohibited until Nov. 1, 1920.

Beaver. The hunting or killing of beaver is prohibited prior to Nov. 1, 1915.

The hunting or killing of land otter, mink, musk rat, martin, fisher, and ermine is prohibited throughout the season from April 1 to July 31.

The hunting or killing of black bear is prohibited throughout the season from April 1 to July 31.

The hunting and killing of fox, wildcat, or lynx is prohibited throughout the season from April 1 to September 30.

Permits or licenses may be issued by the Secretary for the taking of fur-bearing animals for scientific purposes and for shipment to zoölogical parks.

The animals enumerated above are the most important fur-bearing animals of the Territory. Foxes are found in great abundance. The pelt of the silver-gray fox, next to that of the black fox, is the most valuable, being worth from \$75 to \$100. Fox farms have been successfully established on some small islands on the Pacific coast. These are leased from the government. A successful attempt has been made to introduce domestic reindeer among the natives. The first importation was made from Siberia in 1892, and in 1912 there were 38,476 reindeer in Alaska, of which the natives owned 62.5 per cent. In the latter part of 1911 the first shipment of reindeer meat was shipped from Nome to Seattle. Although the reindeer have not supplanted dogs as draft animals, they will in time become valuable for fur and for food. The total fur shipments from Alaska in 1912 aggregated \$794,156.63, as compared with \$802,750 in 1911.

Transportation and Communication. Transportation is the vital problem of Alaska. Without it, neither the great mineral resources nor the agricultural possibilities can be developed. On the other hand, the uncertainty which has attended the tying-up of the coal lands (see *History*), even more than financial and engineering difficulties, has discouraged railroad construction. No new lines were built for several years prior to 1913, and, in the face of a tax of \$100 per mile, several existing lines were not in operation.

Of the nine lines of railroad in 1913, with a combined mileage of 466 miles, the principal lines were: the Copper River and Northwestern, extending 197 miles from Cordova to Kennicott and a property of the Alaska Syndicate; the White Pass and Yukon, extending in a northerly direction from Skagway 20 miles in American territory and thence 82 miles in Canadian territory to White Horse, along the line of the historic Klondike trail; the Alaska Northern, which extends 71 miles northward from Seward, but which, under the name "Alaska Central," was originally projected into the interior before financial disaster overtook it in 1909; the Seward Peninsula, about 75 miles long, with its terminus at Nome; and the Tanana Valley, which is the only important line in the interior

and runs about 50 miles from Fairbanks to Chena, among the principal placer mining camps of the neighborhood. The Copper River and Northwestern and the Alaska Northern alone are standard gauge.

The urgency of further railroad construction in Alaska is recognized by the Federal government. The Civil Government Act of 1912 (see *Government*) authorized the President to appoint a commission, consisting of an army and a navy engineer, a representative of the Geological Survey, and a civil engineer experienced in railroad construction, to study the transportation problem. The Commission's report, transmitted to Congress on Feb. 6, 1913, recommended, as the best of a number of possible routes, the construction of two trunk-lines: (1) from Cordova to Fairbanks, tapping the Yukon and Tanana valleys and also the Bering River coal fields; and (2) from Seward along Cook Inlet to Iditarod, tapping the Kuskokwim valley and also the Matanuska coal fields, in all, about 733 miles at an estimated average cost of \$48,000 per mile. The Commission reckoned on the basis both of public and of semi-private construction, but did not commit itself to either.

Early in the first session of the 63d Congress, bills were introduced, based substantially on the Commission's report and providing for the construction of Federal railroads between harbors of the southern coast and the interior valleys. The essential features of the bill passed by the Senate, Jan. 24, 1914, were: (1) the exact routes to be determined at the President's discretion; (2) the scheme to be financed by a bond issue of \$40,000,000 at 3 per cent, which should be paid off from part-proceeds of the sale of public lands within the Territory; (3) operation to be directly by the government or on leases not to exceed ten years; (4) facilities to be such as to secure coal for naval purposes. This legislation was urged in the presidential message of Dec. 2, 1913, and the concurrence of the House seemed certain.

The Alaska Road Commission, created in 1905, directs the construction of roads and trails throughout the Territory. In 1913 the total mileage was: Wagon roads, 862 miles; sled roads, 617 miles; trails, 2116 miles. The construction in 1911 of a united trail from Seward on the Pacific slope to Iditarod shortened the winter route to Nome by about 300 miles. In 1913, automobiles were running over a new road between Valdez and Fairbanks, in the interior.

River navigation has been an important factor in the commerce of Alaska. Because of the latitude at which they enter Bering Sea, the Yukon River is useful for two and the Kuskokwim River for three months only, as connecting links with ocean-borne commerce. The entrance of the Yukon is shallow and the channel shifting, and the entrance of the Kuskokwim is tortuous and little known; but once inside, an ordinary river boat can navigate the Yukon to White Horse, in Canada, about 2200 miles, the Tanana, its largest tributary, to Chena, near Fairbanks, and the Kuskokwim to the Forks, about 650 miles from the mouth. With their tributaries, the two systems provide about 5000 miles of navigable water. Despite the short open season, three to three and a half months, and occasional interruption in places by low water, the possibilities of their utilization in the development of their great valleys will suffice for many years. Navigation also exists

on the lower Copper, the Kobuk, and other streams.

The Pacific coast line of Alaska, including the Aleutian Islands, has many excellent harbors. These are open to navigation throughout the year, with the exception of Cook Inlet, which is closed by ice from November until May. The northern half of Bering Sea is closed to navigation from about November to June, but the ice-pack does not come far south of St. Lawrence Island. This part of the coast is almost without harbors. The Arctic Ocean is open only from July to September.

Cables give telegraphic communication with Seattle from certain ports of southeastern Alaska—Cordova, Valdez, and Seward. Telegraphic lines run from Valdez to Fairbanks and down the Yukon to St. Michael, which is connected by wireless station with Nome. These are all military lines. The Navy Department maintains wireless stations at Kodiak and at Unalaska. The War Department has wireless stations at Sitka, Cordova, Fairbanks, Circle, Eagle, Gibbon, and Nulato; and there are private stations at Iditarod and on Bristol Bay. Many of the mining districts are provided with telephone lines.

Commerce. As has been indicated, Alaska's chief industries are mining and fishing, and next to these comes the fur trade, but this is declining, and some districts no longer yield skins enough for local use. Lumbering is only a local industry. There is an abundance of wood suitable for pulp, but no use has been made of it. Although great advances have been made in agriculture, the value of the products is still relatively unimportant.

The volume of commerce is, however, on the increase. The aggregate value of merchandise shipments to and from the Territory in the fiscal year of 1913 was \$67,150,519, as against \$64,122,506 for 1912. The greatest increase noted in the shipments from Alaska was in salmon, where there was an increase of \$2,875,791. The merchandise shipments to Alaska from the United States amounted to \$20,179,547 for the fiscal year of 1913, as against \$18,809,270 for 1912. Manufactured goods ready for consumption comprised the greater part of these shipments, especial increase being noted in machinery. The chief points to which the products of Alaska are sent are Seattle, Tacoma, and San Francisco. Almost all foreign trade is with Canada, though there is a little with Siberia.

Population. The natives of Alaska belong to four groups: the Esquimaux, the Aleut, the Thlinkit, and the Athabaskan. The Esquimaux inhabit all the northern part of the Territory, including the area tributary to the Arctic Ocean and the eastern shore of Bering Sea. Tribes closely related to Esquimaux are found along the eastern shore of the Alaska Peninsula, Kodiak Island, and as far east as the Copper River delta. They are essentially a docile, industrious people, whose food before the coming of the white man was chiefly fish, walrus, and seal, together with caribou in some districts. They are skilled in carving and are excellent boatmen. The Aleut, closely related to Esquimaux, are found only on the Aleutian Islands and adjacent mainland. They also are excellent boatmen and are renowned as hunters of the sea otter, an animal exceedingly difficult to approach. The Thlinkits and the closely related

tribe called Haidas are confined to the Panhandle. At the coming of the Russians they were the most civilized of the native tribes and also the most warlike. They lived in well-built log houses and had an organized tribal system. They are skilled craftsmen and are of far greater intelligence than any of the other aborigines. The Athabaskans (the same stock as the North American Indian) dwell in the interior, reaching the coast only at Cook Inlet. They are a race of hunters, but those dwelling on the larger rivers also use salmon. With the exception of some of the isolated Esquimaux tribes, they are to-day the least civilized of Alaskan natives. Only the coastal natives appear to have any definite tribal organization; the rest are grouped rather by families. Tribal organization has never been recognized by the United States government.

Enforcement of the stringent laws of 1909, prohibiting the sale or furnishing of liquor to natives, has checked demoralization from drunkenness. The introduction of reindeer among the Esquimaux has improved their condition, their income from this source being, in 1911, \$42,216.

The improvement in the native schools has had excellent results, especially among the children. The natives of Alaska, generally, are self-reliant, and many of them engage in profitable industries, especially in the commercial fisheries, and to some extent in the mines in the southeastern part of the country. The natives of the Copper River valley and the Aleutian Islands are poorer than those of most other parts of the Territory, but extreme conditions are not prevalent. The greatest menace is infectious diseases, but the work of physicians of the Bureau of Education has greatly improved health conditions.

The total population of the Territory in 1910 was 64,356; in 1900, 63,592, and in 1890 (partly estimated), 32,052. The increase of nearly 100 per cent in the decade 1890-1900 was due to the rush of the gold-hunters. Although a considerable number of those enumerated in 1900 did not remain in the Territory; and although the natives and Chinese decreased by more than 6000, there was, nevertheless, a slight increase in the population in the decade 1900-10.

The Indian population is almost entirely native. It decreased from 29,536 in 1900 to 25,331 in 1910. The native population, which includes Indians, native whites, and natives of other racial elements, decreased from 50,931 in 1900 to 43,921 in 1910. Of the native population in 1910, 60.6 per cent were born in Alaska, 38.1 per cent in the United States proper, and 1.3 per cent in the Philippine Islands and other outlying territory of the United States.

The white population in 1910 was 36,347, and 22,734 of these were either foreign born or native born of foreign parentage. Of the 17,974 foreign-born whites, 15.1 per cent were born in Sweden, 14.4 per cent in Norway, 12.3 per cent in Canada, 8.6 per cent in Germany, 6.4 per cent in Ireland, 5.7 per cent in England, and 37.4 per cent in other countries. There were, in 1910, 2461 foreign-born colored inhabitants, of whom 1057 were born in China, 897 in Japan, 418 in Canada, and 89 in other countries.

In the total population in 1910 there were 45,857 males and 18,499 females. The number of males to 100 females in the white population

in 1910 was 500.1. This high percentage of males is accounted for by the fact that a large proportion of the native white population is composed of male immigrants from other sections of the United States.

The number of inhabitants per square mile in 1910 was 0.1, the same as in 1900. This is equivalent to an average area of 9.2 square miles, or 5888 acres to each inhabitant. The dwellings in Alaska in 1910 numbered 16,612, and the families 17,809.

There were, in 1910, 14 incorporated towns in the Territory, and of these 7 had a population of 1000 or more. Fairbanks, the largest city, had, in 1910, 3541 inhabitants. The other incorporated places with population in 1910 are: Nome, 2600; Cordova, 1152; Juneau, 1644; Ketchikan, 1613; Treadwell, 1222; Douglas, 1722; Skagway, 872; Valdez, 810; Wrangell, 743; Seward (incorporated in 1912), 534; Haines, 445; Petersburg, 585; Chena, 138; Eagle, 178. The town of Iditarod was incorporated in 1911, and Tanana in 1913. As there were no incorporated places in 1900, it is impossible to give an accurate comparison of population for the two census years. Nearly all these towns show an increase, but several show decreases. Among these is Nome. Sitka, not incorporated in 1910, had a population of 539. The figures for population given above include only those for the white population. In many cases there are, in addition, native villages near these towns which equal or exceed them in population. The government maintains garrisons of 200 or 300 men in four forts: William H. Seward, near Skagway; Davis, near Nome; Liscum, near Valdez; and Gibbin, at the junction of the Yukon and Tanana rivers.

Missions. Christianity came to Alaska through the Greek Catholic missionaries in the early days of the Russian occupation. Wherever the Russians established their trading posts the natives became converts to the Greek Catholic faith. Many of the Aleuts and the natives of the Alaska Peninsula, Kodiak Island, and the vicinity of Sitka still belong to this church, which maintains missions at a dozen localities. Soon after the transfer to the United States, missionaries of other sects went to Alaska and established churches and missions. Now nearly every Christian sect is represented at one or more localities. Besides the Greek church, the Roman Catholics, Episcopalians, Presbyterians, and Congregationalists have the most missions. Probably all of the Alaskan natives are adherents of some Christian sect, though those of the more isolated regions may not visit a mission more than once in two years. Churches for whites of various sects have been established in all of the larger settlements, and many of the clergy have done excellent work in the establishment of hospitals.

Education. The people of Alaska have from the beginning of its occupation shown an interest and pride in their public schools. In the incorporated towns these are supported largely by license money collected in these towns. For places not incorporated provision is made by an Act of Congress passed in 1905. One-fourth of the receipts for license taxes from these communities is set aside to be expended by the government for schools for white children, and for children of mixed blood who lead a civilized life. The native schools are in charge of the United States Bureau of Education. Indus-

trial features are included in the curriculum with a view to attracting the attendance of adults.

Schools are maintained in all the incorporated towns in the Territory. In the schools established by the Act of 1905 the attendance averages about 700. In the native schools are about 4000 pupils. In addition to public institutions, educational facilities are furnished by religious denominations, including those of the Presbyterian, Roman Catholic, Moravian, Methodist, Episcopal, Friends, the Swedish Evangelical, and the Greek Orthodox churches.

Because of the small number of children of school age in the Territory the per capita cost of public instruction is relatively high. The total expenditures for places outside incorporated towns was, in 1912, about \$50,000.

Government. Prior to Aug. 24, 1912, Alaska was a district, or unorganized Territory, with no local legislative body. All its laws were made by the Congress of the United States, and the administrative and judicial officers were appointed by the President.

The Civil Government Act passed by the Sixty-second Congress, and approved by President Taft on the date noted above, created a legislative assembly with limited powers. The passage of this act marked the close of long-continued agitation both within and without the borders of the Territory for some form of self-government. President Taft, in repeated messages to Congress, urged the necessity for the passage of measures providing for this. His preference was for a commission form of government until the Territory should be fitted for actual self-government, but he was satisfied with the modified powers of government given by the act, and therefore signed it.

The act first creates Alaska into an organized Territory and establishes a capital at Juneau. It then provides for a Legislature to consist of a Senate composed of eight members, two from each of the four districts into which the Territory is divided, and a House of Representatives, consisting of 16 members, four from each of the judicial districts. The term of office for senators is four years and for representatives two years. The Legislature meets every two years, beginning in March, 1913, and the Governor has power to call special sessions for a period not exceeding 15 days.

The powers of the Legislature are limited. It cannot grant private charters or special privileges; it cannot grant divorces; it must not interfere with existing laws relating to the regulation of the liquor traffic or gambling, and it cannot incur any indebtedness except for the actual expenses of the government. It is not permitted to levy taxes in excess of 1 per cent of the assessed valuation of property, and it can pass no laws which are inconsistent with the laws already passed by Congress. The Legislature was permitted to modify the qualifications of electors by extending the franchise to women. This it did in its first session. The Governor has the veto power, which may be passed over by a two-thirds vote of both houses. All laws must be submitted to Congress for approval before they become valid, and all measures passed must be transmitted to the President within 90 days of their passage. The act contains a provision for the Railroad Commission referred to in the paragraph dealing with transportation.

The first election for members of the Legislature was held on Nov. 5, 1912, and the first session convened on March 3, 1913.

The executive officers of the Territory are a governor, appointed by the President, a secretary (ex officio) of the Territory, a secretary to the governor, and a surveyor-general. The Territory forms a customs district with a collector at Juneau, and 10 deputy collectors at as many ports of entry. There are four judicial divisions, with centres at Juneau, Nome, Valdez, and Fairbanks. Other departments of the government, administered from Washington, are the land office, the department of education, the immigration service, the mine inspection service, the forest service, the game service, the bureau of fisheries, and the health office.

Towns with a population of 300 or more are allowed to incorporate and elect governing bodies, but otherwise there is no local government. Under a law passed in 1906 Alaska is represented in Congress by a delegate elected by male residents of a year or more in the Territory. A complete criminal and civil code was first enacted for Alaska in 1899-1900 and has been amended from time to time. The seat of government was located at Sitka until 1906, when it was removed to Juneau. There is no land tax in Alaska, except within incorporated towns. The assessed valuation of property in nine incorporated towns levying taxes, 1912-13, was \$6,042,068; the average tax rate was 1.31 per cent.

History. The evidence of old maps shows that something was known of the Alaskan coast as early as 1579, but it was not until 1711 that Popof, a Cossack who visited East Cape (Siberia), brought back definite knowledge of Bering Strait and the continent said by the natives to lie beyond. Vitus Bering, sent out by Peter the Great, sailed through Bering Strait in 1728; and in 1731 Gwosdef, a Cossack, was blown on to the Alaskan coast, on which he was probably the first Russian to land. Another expedition led by Bering sighted the Alaskan coast at Mount St. Elias, July 18, 1741, and landed on Kayak Island. Chirikoff, in command of Bering's second ship, reached the vicinity of Sitka on July 15, but the boats sent to make a landing did not return. Bering, returning along the Aleutian chain, discovered a number of islands and finally was wrecked on Commander Island. The first white settlement was made on Kodiak Island at Three Saints' Bay in 1783. During the succeeding half century the Aleutian Islands were explored and exploited by the Siberian fur-hunters, who reached the Alaska Peninsula about 1761. Within the next century exploration gradually advanced from three directions: the Russians reached it from Siberia through Bering Sea and Bering Strait; the English traders came from the east by way of the Mackenzie valley; and navigators of various nationalities approached it from the south by following the eastern shore of the Pacific. Among the most prominent of these expeditions were the Russian ones led by Synd (1767), Krenitzin (1768), Billings (1785), Kotzebue (1815), Lütke (1826); the Spanish ones led by Bodega y Quadra (1774), Arteaga (1779), Martinez (1788), Malaspina (1791); and one French under command of La Pérouse (1785). But the most important exploration was done by Capt. James Cook, of the English navy, who in 1778

surveyed almost the entire coast line between lat. 58° and 70°. These surveys were extended by various English navigators, notably Vancouver (1793-94), Franklin (1826), Beechey (1826), and the Franklin relief expeditions (1848-53). Meanwhile the English fur traders had approached from the east, and the explorations of Mackenzie (1793), Dease and Simpson (1837), Murray (1847), and Campbell (1848) had added much to the geographic knowledge of the Territory. The Russian fur-trading interests were consolidated in 1788 into a single company, under the management of Alexander Baranof. This so-called Russo-American Company by royal charter obtained a monopoly of the fur trade throughout Alaska and held it until the transfer to the United States. The company gradually extended its field of operations: it founded Kodiak (1792), Sitka (1804), St. Michael (1834), and Nulato (1841); and explored the Lower Kuskokwim, the Yukon as far as the Tanana, and the lower stretches of the Susitna and Copper rivers. In 1865-66 explorations were made by Robert Kennicott, W. H. Dall, and other employees of the Western Union Telegraph Company with the object of connecting Europe with America by telegraph, but the success of the Atlantic cable led to the abandonment of the project. The Russian colonists made no attempt to develop any resources except the furs, and as these generally decreased, the country was considered less valuable. In March, 1867, by treaty negotiated by William H. Seward, Secretary of State, in spite of much opposition, Russian America was ceded to the United States for \$7,200,000 in gold.

On Oct. 18, 1867, the Russian flag was lowered from the flagstaff in front of the Governor's residence at Sitka and the United States flag hoisted amidst the booming of cannon. This was the act of formal transfer by which Russian-America became Alaska and a possession of the United States. At a number of points in southeastern Alaska and Kodiak extensive barracks were erected and occupied by United States troops, while an army officer represented the Federal government. But ten years later all troops were withdrawn, and for a number of years the country was governed by a naval officer stationed at Sitka. Then even this control lapsed, and Alaska was left for a time in the anomalous position of being without either military or civil government. A civil government was enacted by statute in 1884, and has continued with some modifications up to the present day. (See *Government*.) The Alaska Commercial Company succeeded to many of the fur-trading interests of the old Russo-American Company, and as late as 1891 maintained almost a monopoly in this field. For many years after its acquisition Alaska was neglected by the Federal government. The Coast Survey took up the systematic mapping of the shore line, but little attempt was made to explore the interior. The Yukon was mapped in 1869 by Capt. R. W. Raymond, U. S. A., who was sent to determine the approximate position of the international boundary and thus settle the conflicting interests of American and British traders; and in 1883 by Lieut. Frederick Schwatka. Schwatka crossed the Chilkoot Pass (called by him Perrier Pass) with a small party and built a raft at the headwaters of the Lewes and continued down the river in this unmanageable craft, running the various rapids, to Fort Selkirk at the junction of the Pelly and Lewes. From this point on he

was traversing a river which had been explored by the Western Union Telegraph agents and was already occupied by the fur-traders. Schwatka continued his trip to Fort Yukon and thence to the sea.

In 1884 Lieut. W. R. Abercrombie, U. S. A., was detailed to make an exploration of the Copper River, but ascended it only a short distance. This work was taken up again in the following year by Lieut. Henry T. Allen, U. S. A., who, with four men, landed at the mouth of the Copper River in March, 1885, and made his way up that stream by boat and sled for about 300 miles; then crossed to the Tanana by way of the Suslota Pass, and, securing another boat from the natives, continued his journey to the mouth of the Tanana. With indefatigable energy Allen then, with one companion, crossed to the Koyukuk from near the mouth of the Melozi River, and explored it almost from the Arctic Circle to its junction with the Yukon. Crossing by portage from the Lower Yukon to Norton Sound, he made his way to St. Michael, whence he returned by steamer to the United States. Lieut. G. M. Stoney, U. S. N., and Lieut. J. C. Cantwell, U. S. Revenue Marine Service, explored the Noatak and the Kobuk. In 1889 J. E. McGrath and J. E. Turner located the international boundary on the Yukon and the Porcupine. The public interest aroused by the discovery of the Klondike (1897) induced Congress to make appropriation for systematic surveys and explorations by the United States Geological Survey. The Susitna, Kuskokwim, White, and Tanana rivers were explored in 1898, and the Chandlar and Koyukuk rivers in 1899. In 1901 a United States Geological Survey party made a trip the entire length of Alaska, from the southernmost limit to Point Barrow; while another explored the headwaters of the Allen and Kobuk rivers and followed the latter to its mouth at Kotzebue Sound. In 1902 the western front of the Aleutian Range was explored. By 1905 over one-fifth of the Territory had been surveyed and less than one-quarter remained unexplored. In the meantime settlements had rapidly increased both in the interior and along the coast. But many of those founded during the gold craze of 1897-98 were short-lived, for at that time the entire placer-mining industry could not support a population of more than a few thousand. Conditions, however, were completely changed by the discovery of the Nome gold fields (see *Mining*), since which time Alaska has been very prosperous.

Boundary Dispute. When the United States acquired Alaska (1867), its eastern boundary had been fixed by the terms of a treaty made between England and Russia in 1825. At the time this treaty was negotiated England made a determined effort to secure a Pacific outlet for her fur trade, which even then had reached the headwaters of westerly flowing rivers. Russia, however, maintained that the coastal strip as far south as lat. $54^{\circ} 40'$ was hers by right of discovery and occupation, and forced England to accede to her demands. Article III of this treaty, delimiting the first section of the boundary, provides that it shall run from the southernmost point of Prince of Wales Island ($54^{\circ} 40'$), ascend to the north along Portland Canal to that part of the continent where it strikes the 56th parallel, and thence follow the summit of the mountains parallel to the coast as far as the intersection with the 141st meridian,

from which point the 141st meridian shall serve as the line of demarcation between Russian and British possessions. It provided, furthermore, that whenever the summit of the mountains (north of lat. 56°) shall prove to be more than 10 marine leagues from the ocean, the boundary shall consist of a line parallel to the windings of the coast and never exceeding 10 marine leagues therefrom. For upwards of 50 years this delimitation of the boundary appears to have satisfied England and Russia and the United States, for no question was raised regarding it. In 1835 the Hudson's Bay Company attempted to establish itself in what is now southeastern Alaska, but was promptly ejected by the Russian authorities and received no support from England. The conflict between the two rival fur-trading interests was settled by the Hudson's Bay Company leasing a strip of the mainland. That part of the boundary which followed the 141st meridian (north of Mount St. Elias) was absolutely fixed, but to the south the line was less easily defined. As there was no well-defined range of mountains running parallel to the coast, it was generally conceded that the line should lie everywhere 10 marine leagues from tidewater following the sinuosities of the coast, and it was thus indicated on all British and American maps up to about 1885. Meanwhile the discoveries of gold in the inland region made an outlet to the coast all-important to the Canadians. They claimed that the 10 marine leagues should not be measured from the actual shore line, but from a line connecting headland to headland, and even went so far as to state that the boundary should not follow Portland Canal but Clarence Strait. If this claim had been recognized, it would have thrown into Canada the heads of the longer fiords, as well as several of the southern islands (Revillagigedo, Gravina, etc.) of the archipelago. It would have given the Canadians a seaport on Lynn Canal and left the United States with a series of narrow, broken strips of mainland. When this contention was officially put forth in 1888, surveys of the disputed strip of territory were undertaken by mutual agreement. Thus matters went on, until the discovery of the Klondike gold fields (1896) brought the affair to an issue. The people of Alaska were justly indignant that the dispute was not settled. In a number of instances the local officers came to a clash within the disputed territory. On Jan. 24, 1903, a treaty was signed between the United States and Great Britain creating the Alaska Boundary Tribunal, to consist of six impartial jurists, three from each country to settle the dispute. Henry Cabot Lodge, Elihu Root, and George Turner represented the United States, while Richard Everard Alverstone, Lord Chief Justice of England, and Louis Amable Jetté and Allen Bristol Aylesworth, Canadians, represented Great Britain. The tribunal met in London on Sept. 3, 1903, and on October 20 a decision was reached by a majority, the United States representatives and Lord Alverstone voting against the two Canadians, which was an almost complete vindication of the United States contention, though the actual demarcation of the boundary threw about one-third of the disputed area into Canada. By this decision the Canadians were finally shut off from the sea-coast north of $54^{\circ} 40'$. The larger entrance to Portland Canal was given to Canada and the boundary established through Pearse Canal. Surveys to locate these boundaries were

at once begun and continued through the years following.

Coal Land Dispute. The controversy which has marked the attempts to open up the coal deposits of Alaska has been one of the most prominent features of its political history. Suspicion of fraud and monopoly has naturally induced extreme caution; on the other hand, delay in the development of the coal resources has caused equally natural discontent within and without the Territory. The whole question, moreover, has been confused by its intimate connection with a recent and still beclouded partisan controversy.

The situation and extent of the coal deposits of Alaska have been noted in the paragraph on *Geology and Mineral Resources*. The application of as much of the public land laws of 1873 as relate to coal lands was extended to Alaska by act of June 6, 1900. Since these laws, however, contemplated a public survey prior to location, they were not effective in Alaska. This defect was remedied by a supplementary act of April 28, 1904, which permitted individuals to locate claims of 160 acres by permanent monuments, accompanying their applications for entry, to be made within three years, by plats and notes of private surveys. An executive order of Nov. 12, 1906, withdrew all coal lands in Alaska from entry, being modified by a later order so as not to apply to locations made prior to that date.

Under the Act of 1904 and previous to the executive order of 1906, claims were made covering nearly all the deposits of the Bering River field. Since the law permitted claims to be made in person or by power of attorney, agents were active, and most of the claims occurred in groups, which passed commonly under the names of the agents. The "Cunningham group" was the most notable of these, partly because of the value of the deposits it covered, but largely because the claims it comprised progressed farthest toward final patent and brought the coal land dispute to a head. This group was in the Bering River field, and consisted of 33 adjoining claims of approximately 160 acres each, of which one was held directly by the agent, Clarence Cunningham. Preliminary steps were taken in 1903, and the claims were registered in 1904.

In general, the sources of fraud feared in Alaskan coal cases have been: first, "dummy" claimants; second, collusion between bona-fide claimants to operate corporately. Especially keen has been the fear of monopoly by the Alaska Syndicate, otherwise "The Morgan-Guggenheim Syndicate,"—a fear which, whatever its basis in fact, remains one of the controlling factors in the Alaskan situation. The applicants in the Cunningham cases were, in the main, substantial business men of the Northwest, and were hardly suspected of being 'dummies.' The possibility of collusion was the subject of an investigation stretching over seven years. Preliminary inquiries were made in 1905 by a special agent of the Land Office, lapsing until Aug. 7, 1907, when an uncertain report was made upon 25 of the 33 claims. In the meantime, in the spring of 1907, Richard Ballinger, Commissioner of the Land Office from March 5, 1907, to March 5, 1908, ordered Horace T. Jones to conduct a vigorous inquiry. Mr. Jones's final report of November 1 urged further investigation. At the Commissioner's order, Luther R. Glavis,

Chief of the Field Division at Portland, took up the inquiry. On Dec. 23, 1907, Mr. Ballinger ordered the claims clear-listed, but, upon protest from Mr. Glavis in the field, this order was revoked in January when the claims were all but patented. On March 6 the affidavit of Clarence Cunningham was secured, to the effect that his clients had nothing to do with the Guggenheim interests. Later evidence showed, however, that on Dec. 7, 1907, the Guggenheim Syndicate had taken up an option on one-half interest in the Cunningham properties. Furthermore, the affidavit, in ridiculing the impracticability of the existing coal land laws, virtually confessed an intention to work the claims together.

The impracticability of working a 160-acre claim independently under the rough-surface conditions of Alaska was the subject of a remedial act of May 28, 1908, which permitted individual claims, thus far located and entered in good faith, to be consolidated. Stringent provisions against monopoly were added. This act complicated the questions of fact in the Cunningham cases by a problem of construction. Mr. Ballinger, then in private life, appears by his own statement to have represented the Cunningham interests and to have sought to induce them to proceed under the Act of 1908. On becoming Secretary of the Interior in March, 1909, it was his announced policy to leave the adjustment of Alaskan coal land questions to the Assistant Secretary. From the fall of 1908 to the summer of 1909 the investigation dragged, pending a field investigation. On April 20 and thereafter Mr. Glavis was pressed from headquarters to prepare for an early hearing of the claims. This, he protested, would be disastrous to the government's case. His estrangement with his department increased. Finally, in July, he appealed to the Forestry Bureau, which was legally concerned, since 21 of the claims were in the Chugach National Forest. The intervention of the Secretary of Agriculture secured a postponement of the hearing till October 15. On September 18 Mr. Glavis, who now openly charged officials of the Interior Department with trying to rush through fraudulent claims, was dismissed. The Chief Forester, Gifford Pinchot, espoused his cause, and after a violently denunciatory letter of Jan. 6, 1911, was removed by the President. A Joint Committee of Congress, desired by Mr. Ballinger, investigated the affair, and on December 5 reported, on an almost strictly party division, sustaining the Secretary. No action was taken, but in March, 1911, Secretary Ballinger resigned. Walter L. Fisher became Secretary, March 13, and one of his first undertakings was a thorough trip of investigation through Alaska in the summer of 1911.

The Cunningham claims were finally entered for cancellation on June 16, 1911. This action seemed to signal a wholesale disallowance of the outstanding claims. In June, 1913, of the 1129 coal land claims in Alaska, 765 had been cancelled, and field examination had been completed on the rest. As yet, only two patents to coal land had been granted.

The opening of the Alaskan coal fields, then, remains a problem, depending for its solution in part on railroad development (see *Transportation*), in part on a modification of the coal land laws. Probably some system of leasehold, which Secretary of the Interior Lane urged most

emphatically in 1913, will mark the policy of the future.

The same popular outcry against monopoly in Alaska, and especially against monopoly by the "Morgan-Guggenheim Syndicate," which marked the coal land controversy, was further provoked by an executive order of Oct. 28, 1910, which withdrew about 12,800 acres along Controller Bay from the Chugach National Forest and opened them to private entry. Controller Bay is about 25 miles from the Bering River coal field and is the nearest harbor. Monopoly of the coal through a control of terminal facilities was feared. Richard S. Ryan, president of the Controller Bay Railroad and Navigation Company, had petitioned for the withdrawal in 1909, and after the order of 1910, made three scrip entries, aggregating 159 acres. Complying with a Senate resolution of April, 1911, President Taft defended his action in a special message of July 26, 1911, stating that Mr. Ryan had no connection with the Guggenheim interests and that, in all events, the reservation of 80 rod strips between claims having a frontage of 160 rods on navigable waters, in compliance with the law of 1898, was ample guarantee against any future monopoly of terminal facilities. In an address before the American Mining Congress on Oct. 27, 1911, after his return from Alaska, Secretary Fisher indorsed the President's view and also depreciated the value of Controller Bay as a harbor.

In August, 1912, James Wickersham, Progressive Republican, was reelected delegate to Congress by a large plurality. In 1913 Major J. F. A. Strong of Iditarod was appointed Governor.

For an account of the remarkable eruption of the Katmai volcano on June 6, 1912, see VOLCANOES.

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ALASKA SA'BLE. A name sometimes applied to the fur of skunks when dyed and prepared for the market.

ALASKA-YUKON EXPOSITION. See SEATTLE.

ALAS'KITE. An igneous rock that consists essentially of quartz and alkali-feldspar. It represents the extreme in silica content of the commoner types and includes many that hitherto have been described as granite, rhyolite, aplite, and similar acidic rocks. The name has been recently introduced in petrology (first employed by Spurr with reference to certain Alaskan rocks), but has gained quite general acceptance among students of that science. See GRANITE.

ALASSIO, à-läs'syô. A seaport of Liguria, Italy, on the Gulf of Genoa, 57 miles by rail southwest of the city of Genoa (Map: Italy, C 3). In winter it is frequented by foreigners, particularly by English-speaking people, and in summer the excellent bathing attracts Italians. The natives are mostly fishermen and boat-builders. Pop., 1901, 5630; 1911, 5558. Consult Scheer's *Alassio und seine Umgebung* (Weisbaden, 1886).

ALAS'TOR (Gk. 'Αλάστωρ). 1. An avenging, haunting spirit. Among the Greeks the name was sometimes applied to Zeus as an avenging deity; also to the Furies. In the Middle Ages it was given to one of Satan's chief ministers, a demon supposed to execute his purposes. 2. A poem by Shelley, published in 1816, entitled in full, *Alastor, or the Spirit of Solitude*.

ALATAU, ä'lä-tou' (Turk. mottled mountain range). A name given to a range of lofty mountains forming the boundary between Turkistan and Mongolia and the northern limit of the great tableland of Central Asia (Map: Asia, G 4). It is made up of three sierra-like subranges, the Dzungarian, the Trans-Ili, and the Kuznets Alatau. These are all grouped around Lake Issik-Kul as a central point. The peaks of the Alatau, which are principally of granitic formation, attain an elevation of over 15,000 feet.

AL'ATER'NUS (Lat.). The old name of a genus which has now been merged with the genus *Rhamnus*. (See BUCKTHORN.) The common European plant which has long been referred to *alaternus* is a large shrub, densely branched, with shining leaves and clusters of small flowers much frequented by bees. The

berries partake of the purgative qualities attributed to *Rhamnus cathartica*.

ALATRI, ä-lä'trè. An episcopal city in South Italy, 9 miles north of Frosinone (Map: Italy, H 6), occupying the site of the ancient Aletrium. Is a summer resort and contains important cloth factories. Ruins in the near-by valley of Cosa exemplify to a marked degree the characteristics of ancient fortifications. There are fine examples of twelfth-century painted wood carving in the church of Santa Maria Maggiore. Pop., 1901, 15,322; 1911, 16,323.

ALATYR, ä'lä-tēr'. The chief town of a district in the government of Simbirsk, Russia, on the Sura, 107 miles northwest of Simbirsk (Map: Russia, G 4). It has two cathedrals, four monasteries, a hospital, schools, etc. Milling, brewing, and brick-making are the principal industries. Pop., 1897, 11,100. It was founded in 1552 by Ivan the Terrible.

ALAUZI, ä'lou-sé'. A town on the Alausí River, in the province of Chimborazo, Ecuador, 75 miles east of Guayaquil (Map: Ecuador, B 4). It is situated 7980 feet above sea level on a fertile plateau of the Andes. Textiles are manufactured. The town is a health resort, as there are hot springs in the neighborhood. Pop., 1910 (est.), 5000.

ALAUZ, ä'lö', JEAN, called LE ROMAIN (1786-1864). A French historical painter, born at Bordeaux. He was a pupil of Vincent and Guérin, director of the French Academy at Rome from 1846 to 1853, and in 1851 was elected a member of the Institute. The principal cause of his reputation was the favor shown him by Louis Philippe, who gave him commissions for several hundred pictures in the Museum of Versailles. He restored several rooms in the Palace of Fontainebleau and decorated the cupola of the Palace of the Senate. His cold and academic art is devoid of true pictorial qualities.

ALAVA. See BASQUE PROVINCES.

ALAVA, ä'lä-vä, DON MIGUEL RICARDO DE (1771-1843). A Spanish general. He was born at Vittoria, Spain, and died at Barèges, France. Sprung from a noble family, he entered the navy in early life, but changed later to the land service. His political conscience was as flexible as his political career was checkered. He abandoned Ferdinand VII for the French in 1808; left the French for the English in 1811, and entered once more into the service of Ferdinand, in 1815, as Minister to The Hague. In 1820 he was leader of the Liberals in the Cortes; in 1822 he fought against Ferdinand's guards at Madrid, and the next year he negotiated with the Duc d'Angoulême for the restoration of Ferdinand to his throne. Fearing Ferdinand's vengeance, however, Alava fled the country. From his exile in England he was recalled by Maria Christina, who made him Ambassador, first to London, in 1834, and, in 1835, to Paris. The following year he refused to swear to the constitution of 1812, reestablished by the insurrection of La Granja, and retired to France.

ALAY, ä-lī'. A Turkish ceremony on the assembling of the forces at the breaking out of a war, the chief feature of which is a public display of the sacred standard of Mohammed, which may be looked upon only by Moslems and touched only by emirs. It is a capital offense for a Christian to look upon the banner.

ALB. See COSTUME, ECCLESIASTICAL.

ALBA, ä'l'bä (ancient Lat. *Alba Pompeia*, White Pompeia). An episcopal city of the prov-

ince of Cuneo, North Italy, situated on the right bank of the Tanaro, 31 miles southeast of Turin (Map: Italy, C 3). The vast Gothic cathedral of San Lorenzo dates from 1486, and there are rich collections of ancient manuscripts, coins, vases, and household utensils. The country produces wine, grain, cattle, silk, truffles, and cheese. Pop., 1901, 12,800; 1911, 14,176.

ALBA, ä'l'bä, DUKE OF. See ALVA.

ALBACETE, ä'l'bä-thä'tä. A town of Spain, capital of the province of the same name, in Murcia. It is situated at an altitude of more than 3800 feet, 138 miles southeast of Madrid, and on the railway which runs from Madrid to Alicante (Map: Spain, E 3). It stands in a fertile but treeless plain; consists of an upper and a lower town, the latter of which, being modern, is built with some degree of regularity, and contains a number of squares, hospitals, a bull ring, and many good houses. It is a place of considerable trade and is noted in Spain for the manufacture of knives, daggers, and cutlery. There are sulphur mines near by, matches are manufactured, and there is considerable trade in agricultural products. Annual cattle fairs are held here. Pop., 1887, 20,700; 1900, 21,373; 1910, 24,805.

AL'BACORE, or **AL'BICORE** (Portug. and Sp. *albacora*, from Ar. *al*, the + *bakr*, a young camel, a heifer). A tunny, especially the long-finned, or alalonga. See TUNNY.

AL'BA LON'GA. An ancient town of Latium, founded, according to the popular account (Livy, i, 3; Vergil, *Aeneid*), by Ascanius, son of Æneas, on a ridge overlooking the Alban Lake (Albanus Lacus). Here lived several generations of kings, and here were born the twins Romulus and Remus, sons of King Numitor's daughter, Rhea Silvia, by the god Mars. Alba Longa was destroyed under Tullus Hostilius, third king of Rome, and never rebuilt, its inhabitants being removed to Rome (Livy, i, 32). The legend, in its general outline, is doubtless based on facts. In 1817 a remarkable prehistoric necropolis was found here, buried under volcanic ashes and containing burial urns in the form of round huts. (See ARCHÆOLOGY.) The site of the town seems to have been near the modern Castel Gandolfo. The Emperor Domitian had a villa there.

ALBAN, ô'l'ban, SAINT. According to legend, the first martyr of Britain. He was born at Verulam in the third century, and after having long lived as a heathen, was converted to Christianity, but put to death in 304. His day is June 22. The town of St. Albans, which bears his name, is believed to stand on the site of his birthplace or the scene of his martyrdom. See ST. ALBANS.

ALBAN LAKE. See ALBA LONGA.

ALBA'NI. In ancient times, a people in Asia inhabiting the country between the Caucasus and the Cyrus River, and between Armenia and the Caspian Sea, corresponding with the modern Shirvan and southern Daghestan. The ancient Albanians were described as tall, strong, and of graceful appearance. They were nomads. A Roman army under Pompey first encountered them in 65 B.C. and found a force of 60,000 infantry and 22,000 cavalry opposing it. Pompey secured a nominal submission, but they continued practically independent.

ALBANI, ô'l'bä-nī. A rich and celebrated family of Rome, who came originally from Albania in the fifteenth century and settled first

at Urbino. The great influence of the family dates from the accession (1700) of Giovanni Francesco Albani to the papal throne as Clement XI. It has since furnished a succession of cardinals. Cardinal Alessandro Albani (q.v.) made the celebrated art collection of the Villa Albani at Rome.

ALBANI, ALESSANDRO (1692-1779). A nephew of Pope Clement XI, who insisted on his entering the priesthood and to whom Albani's worldly life later gave much trouble. He was created Cardinal by Innocent XIII in 1721. He was born at Urbino and was a brother of Annibale Albani. Under Maria Theresa, he served as Minister at the Papal Court and Crown-Protector of Austria. After his death his collection (at Rome) of statues and other works of art was bought by George III.

ALBANI, EMMA (1852—). The stage name of Marie Louise Cecilia Emma Lajeunesse. A Canadian dramatic soprano. She was born at Chambly, near Montreal, Nov. 1, 1852. She made her first public appearance at Albany, N. Y., when but 12 years old. She studied under Duprez, of Paris, and Lamperti, of Milan, made her début at Messina as Amina in *La Sonnambula* (1870), and has sung in opera in London, Paris, Berlin, St. Petersburg, and many cities of the United States. Among her impersonations are Senta in the *Flying Dutchman*, Elisabeth in *Tannhäuser*, Elsa in *Lohengrin*, Marguerite, Lucia, Mignon, Ophelia, and Isolde. Madame Albani has also sung in oratorio. She married Ernest Gye, the impresario, in 1878. Consult H. S. Edwards, *The Prima Donna* (London, 1888). She published her memoirs under the title *Forty Years of Song* (London, 1911).

ALBANI, FRANCESCO (1578-1660). An Italian painter, one of the principal representatives of the Eclectic school of Bologna (q.v.). He was born at Bologna, where he studied first with Calvaert, a Netherlander, and then in the school of the Carracci (q.v.), chiefly under Agostino. To his earliest period belongs the cycle of frescoes in Palazzo Fava (1598) representing the "Life of Æneas," and the "Life of the Virgin" in the Palazzo dei Conservatori, Rome. About 1600 he removed to Rome and became an assistant to Annibale Carracci, whose influence gradually supplanted that of Agostino in his works. He took a prominent part in the former's frescoes in Palazzo Aldobrandini, Rome, and practically executed those representing the "Life of San Diego" in San Carlo degli Spagni, Rome, now in the museum of Barcelona. His other frescoes include the important ceiling of the Palazzo Torlonia, Rome, decorated with subjects from Ovid, those of the choir chapel of Santa Maria della Pace, Rome. His easel pictures of this period are hard to distinguish from Annibale's. By him are probably the "Ascension of the Virgin" and "John the Baptist," in Dorchester House, London; "Pan Teaching Apollo the Flute" and "Silenus" in the National Gallery, and perhaps the celebrated portrait called "Beatrice Cenci," attributed to Guido. After his return to Bologna in 1616, he married his second wife, Doralice, by whom he had 10 beautiful children, who are said to have served as models for the cupids of his pictures. Wealthy and popular, he led a happy life. His altar-pieces of the period are not important, the best being an "Annunciation" in San Bartolommeo, Bologna; but the smaller religious pictures are better in quality,

particularly his "Holy Families" in Dresden, Louvre, etc. Best of all are his mythological subjects, to which he was by temperament adapted. Prominent among these are four circular panels of antique love subjects in Palazzo Borghese, Rome, often repeated in more or less independent versions. Best known of all his paintings are the "Dancing Cupids" in the Dresden Gallery, which also possesses 10 others; "Cupid Disarmed," "The Toilet of Venus," and 13 others are in the Louvre. The Museum of Turin is particularly rich in his mythological subjects. His last years were embittered by his fierce rivalry with his former friend and lifelong competitor, Guido Reni, and by the loss of his fortune through the mismanagement of his brother. At best his paintings are bright and delicate in color and elegant and graceful in form. The landscapes are particularly charming. His work, however, is unequal in quality, that of the last period being generally inferior. Consult the references under CARRACCI.

ALBANI, MATTHIAS. The name of two famous Tyrolese violin makers, father and son. The father was born in 1621 at Bozen. He was a pupil of Stainer. He died in 1673. The son studied with the masters of violin making at Cremona and afterward settled at Rome. The instruments he made between the years 1702 and 1709 are exceedingly valuable and are by some considered equal to those of Amati.

ALBANI, VILLA. The palace of the Albani family at Rome, containing a famous collection of antique works of art.

ALBANIA, ăl-bă'nî-ă; *Mod. Gk.* ăl'vâ-nyē'ă (Turk. *Arnaut*). An independent principality in the western part of the Balkan Peninsula, extending along the Adriatic from Montenegro to Greece and separated from Serbia mainly by the river Drin and Lake Ochrida. In a wider sense the name is applied to the whole region formerly embraced in the Turkish vilayets of Janina, Monastir, Scutari, and a part of Kossovo, but now annexed to Montenegro, Serbia, or Greece (Map: Balkan Peninsula, C 4). It takes in ancient Illyria, most of Epirus, and parts of Macedonia, and covers an area estimated at from 12,000 to 22,000 square miles, according as the name is taken in a narrower or broader sense. It borders on Montenegro and the sanjak of Novibazar on the north, Macedonia on the east, Greece on the south, and the Adriatic Sea on the west. The entire country is traversed by numerous high mountain chains, alternating with long and narrow valleys, running from northwest to southeast. The elevated plateaus found among the mountain chains are mostly fruitful and well populated, and some of them inclose lakes. The rivers of Albania, of which the most important are the Boyana, Drin, Devol, and Voyussa, have an exceedingly tortuous course, on account of the mountainous character of the surface. The climate is healthful and moderate and the soil for the most part fertile. Grain and tobacco grow well, and the olive is cultivated extensively and widely exported. There are also shipments of fish and sea salt.

There is no actual coördinated government among the tribes occupying this large area, who are mostly Mohammedans, but all have been, in a loose way, subject to the rule of Turkey till the Balkan War of 1912. It was then the desire of Serbia to annex the whole of this

State, or at least to secure the valuable port of Scutari (Albanian: Schodra), but the move in this direction was blocked by the European powers at the instance of Austria.

There is hardly such a thing as education in Albania, although in some parts there are a few schools and at Scutari is a Jesuit college. The sons of some of the leading families are sent abroad for education, and there appears now to be an awakening of the younger element to the importance of acquiring knowledge.

The population of Albania, within the broader limits given above, is probably not far from 2,000,000, of which some 250,000 are Serbs and Bulgars. Albania proper, or the region which is inhabited mainly by Albanians, has a much smaller population (less than 1,000,000). The Albanians, or Arnauts, who call themselves Shkipetars (Skipetars), are the descendants of the ancient Illyrians, and occupy a unique position among the Caucasian races. Only slightly civilized and very warlike, they keep the country in a constant state of turmoil. The differences in religion of the various tribes, their strong feeling of clanship, together with the warlike spirit of the people, afford ample opportunity for civil strife. In their form of government the Albanians still retain some of the patriarchal institutions. The Mohammedan religion is professed by most of them, while the Christians number 190,000, divided almost equally between Roman and Greek Catholics. There are nearly 200,000 Albanians in Greece, found chiefly in Attica, Megaris, and the islands of the Ægean; about 100,000 in southern Italy, and smaller groups in the Slavonic districts of southern Austria-Hungary. The turbulent tribes which inhabited the region in antiquity resisted all attempts at subjugation, and except during the reign of Pyrrhus of Epirus (296-272 B.C.) never acknowledged any supreme authority. In the Middle Ages the inhabitants displayed the same obstinacy in their resistance first to the Greek Empire, then to Serb and Bulgarian invaders, and finally to the Turks. Their great leader, George Castriota, or Scanderbeg (1404-68), overwhelmed twenty-three Ottoman armies, some of them commanded by the Sultan in person, and though after the fall of Scutari, in 1478, the nominal authority of the Porte was acknowledged, the country at all times enjoyed a very large measure of freedom. The conversion of the majority to Mohammedanism in the sixteenth and seventeenth centuries at once distinguished them from the neighboring Serbs, Bulgars, and Greeks who remained Christian, and enabled them to play an important rôle in the history of the Ottoman Empire. From 1807 to 1822 Albania was practically independent under the rule of Ali Pasha (q.v.), the Lion of Janina. The feeling of inveterate hostility for the Greeks kept the Albanians from embracing their cause in the war of liberation. The Turkish Revolution of 1908 (see TURKEY) added impetus to the chronic disorders and insurrections which reached their climax in the revolt of the powerful Christian tribe of Malissori in 1911-12. This revolt, together with concurrent outrages in Macedonia, was one of the causes of the Balkan War of 1912-13 (q.v.), the outcome of which was such as to preclude the further exercise of Turkish dominion in that part of Europe. It had been hoped by the Balkan allies—Greece, Servia, Montenegro and Bulgaria—that they might partition Albania among themselves, but the persis-

tent opposition to such a plan on the part of Austria-Hungary and Italy, both of which had important political and economic interests at stake, caused the European Powers to intervene and to erect a portion of Albania into an autonomous principality under their own protection. By a series of arrangements during 1912-13, the territory formerly embraced under the generic name of Albania was distributed as follows: Ipek and Jakova were awarded to Montenegro; Servia secured Prisrend, Dibra, and Monastir; Greece obtained Janina; while to the principality of Albania were guaranteed Scutari, Alessio, Durazzo, Avlona, and Koritza. In the course of the Balkan War two provisional governments were set up in Albania—a republican form at Valona under the presidency of Ismail Kemal Bey, and a monarchical form under Essad Pasha, an experienced soldier, who enlisted the support of the northern tribesmen. In October, 1913, an International Commission of Control, consisting of six members, chosen one each by Austria-Hungary, Italy, Russia, Great Britain, France, and Germany, was established at Valona. The Powers invited Prince William Frederick of Wied to assume the crown of the principality. Consult: H. Callan, "Albania and the Albanians," in *Scottish Geographical Magazine*, vol. xv (Edinburgh, 1899); P. Traeger, "Mittheilungen und Funde aus Albanien," in *Zeitschrift für Ethnologie*, vol. xxxii (Berlin, 1900); Durham, *High Albania* (London, 1909); Grothe, *Durch Albanien und Montenegro* (Munich, 1913).

ALBANIAN LANGUAGE. The Albanian forms one of the eight chief divisions of the Indo-Germanic languages (q.v.) and is a descendant of the ancient Illyrian, of which only a few words are preserved. On account of the large number of Greek loan-words in its vocabulary, the Albanian was formerly thought to belong to the Hellenic branch of dialects; but it is now known to be quite independent and to form a branch by itself, akin rather to the Slavic family than to the Greek group. Geographically, the language is not confined to Albania alone, but may be traced also in southern Italy and Sicily. Two main dialect-groups of the language may be distinguished. The northern class, called Gegish, is the more primitive, while the southern, or Toskish, is permeated with loan-words. Of all the languages of the Indo-Germanic group, Albanian has been the most changed in vocabulary by borrowed words, although it has preserved in the main its structure. The vocabulary of loan-words is chiefly Latin, augmented by Slavic and Greek accretions, and in Gegish especially, by numerous Turkish words. From the grammatical point of view, its main characteristic is the abundant use of auxiliaries. The verbs have eight conjugations, distinguished by their infinitives. If poor in intellectual terms, it abounds in physical terms. In point of literary culture Albanian is the most backward of all the Indo-Germanic languages, and it can scarcely be said to possess a literature. While it is rich in folk-songs, tales, and proverbs, only within a comparatively short time has any systematic endeavor been made to cultivate the literary potentialities of the people. In the Gegish dialects the alphabet usually employed is the Roman. Consult: G. Meyer, *Kurzgefasste albanesische Grammatik* (Leipzig, 1888); *Etymologisches Wörterbuch der albanesischen Sprache* (Strassburg, 1891); Pedersen, *Albanesische Texte* (Leipzig, 1895); Pek-

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ALBAN (äl'ban) **MOUN'TAINS**. A group of volcanic mountains in Central Italy, 13 miles southeast of Rome, with several extinct craters, two of which are occupied by sombre Lake Albano and beautiful Lake Nemi (Map: Italy, G 6). The central crater terminates in Punta Faete and in Monte Cavo, 3145 feet above the sea, on which stood the temple of Jupiter Latiaris, where the sacrificial festival of the *Feriae Latinae* was celebrated annually. The scanty ruins of the temple disappeared about 1777, when Cardinal York, the last of the Stuarts, built on the spot a Passionist monastery. From here there is a splendid view of the sea, the Campagna, and the surrounding mountains. The beauty of the scenery and the agreeableness of the climate have made the Alban Mountains a favorite summer resort of the Romans from the most ancient times. Places that are worthy of a visit by the tourist are Frascati (q.v.), Albano, Grotta Ferrata, Marino, Castel Gandolfo (q.v.), and Rocca di Papa. The site of Alba Longa (q.v.), Rome's mother city, was on the east side of Lake Albano.

ALBANO LAZIALE, or **ALBANO**, äl-bä'nö lä-t-syä'lä. A town of Italy, about 12 miles southeast of Rome, on the declivity of the lava walls which encompass Lake Albano (Map: Italy, G 6). It is the seat of a bishop and is surrounded by handsome mansions of the wealthier Romans. Pop. (of the commune), 1911, 8826. The town is celebrated for the beauty of its scenery and the purity of its air. It is on the opposite side of the lake from the site of Alba Longa and owed its origin to the villas of ancient Roman magnates, such as Pompey, Domitian, and Clodius, which are replaced in our own times by the villas of the princely families of the Barberini, Altieri, and others. There are a large convent, and a museum of antiquities from Alba Longa. An excellent wine is produced in the environs. Near the town, on the old Appian Way, are found the remains of an amphitheatre and ancient tombs. A notable modern structure is the viaduct passing over the deep valley between Albano and the town of Ariccia. It is 182 feet high, 988 feet long, and was erected by Bertolini during 1846-53. The Alban Lake (Lago di Albano or Lago di Castello), is formed in the basin of an extinct volcano, has a circumference of 6 miles, and a depth of about 560 feet. It abounds in fish and has an elevation of about 960 feet above sea level. Ancient writers say that, while the Romans were at war with the Veientes (398 B.C.), this lake rose to an extraordinary height in the heat of summer. Etruscan diviners declared that the conquest of Veii depended upon letting off the waters of the lake. Stimulated by this, the Romans, under the direction of the Etruscans, opened an emissary or tunnel through the lava wall on the northwest. In the execution of this work they acquired the art of mining, which they now applied to undermine the walls of Veii. The tunnel, which still remains, and still fulfills its ancient office, is more than a mile in length, with a height of 7 feet and a width of 4 feet. It is the only outlet for the

waters of the lake. On the eastern bank of the lake rises Monte Albano, or Monte Cavo, the ancient Albanus Mons, about 3100 feet high, which commands an extensive and magnificent view. Upon its summit once stood the magnificent temple of Jupiter Latiaris, which was approached by a paved way, for the ascent of the solemn processions of the Latin confederation (*Feriae Latinae*) and for the ovations of Roman generals. The road remains, in great part, perfect to this day. The Albano stone, called peperino, was much used in Roman buildings. It is a kind of volcanic tufa, of an ash-color, and is still quarried extensively at Albano.

ALBANS, öl'banz, SAINT. See SAINT ALBANS.

ALBANUS LACUS. See ALBA LONGA.

ALBANY, äl'bä-nī. A seaport and municipality of Plantagenet Co., western Australia, on Princess Royal Harbor, an inlet of King George's Sound, 352 miles from Perth by rail (Map: Australia, D 6). The harbor is one of the finest in Australia and is well fortified. Albany is a port of call for all steamers to Australia taking the Cape route. Its equable climate has made it the health resort of the State. The United States has a resident consular agent. Pop., 1911, 3586.

ALBANY. A city and the county-seat of Dougherty Co., Ga., 107 miles south by west of Macon, on the Central of Georgia, the Atlantic Coast Line, the Seaboard Air Line, the Georgia Southwestern and Gulf, the Georgia Northern, and the Albany and Northern railroads, and on the Flint River, at the head of high-water navigation (Map: Georgia, B 4). It is in an agricultural region and controls large commercial interests, particularly in cotton, cottonseed oil, bricks, fertilizers, lumber, melons, pecans, etc. The city has paved streets, an electric car line, is the home of the Georgia Chautauqua and is noted for numerous artesian wells, which are the exclusive source of the water supply. Settled in 1836, Albany was incorporated two years later. The government, under a charter of 1899, is administered by a mayor, elected biennially, and a council, whose consent is required for all appointments of administrative officials made by the mayor. The water works, gas plant, and electric light plant are the property of the municipality. It also has a public library, a Federal building, court-house costing \$125,000, a hospital, and a Confederate monument. Pop., 1900, 4606; 1910, 8190; 1913 (est.), 12,000.

ALBANY. A city and the county-seat of Gentry Co., Mo., 50 miles northeast of St. Joseph, on a branch of the Chicago, Burlington, and Quincy Railroad, with motor-bus connection with the St. Louis and Omaha (Map: Missouri, B 1). The city has fine residences, is surrounded by rich farming country, and has some commercial and industrial interests. It is best known, however, as the seat of Palmer College, which was recently removed from Le Grand, Iowa, and replaces the Northwest Missouri College. It also has a Carnegie library. Albany is governed, under a charter of 1897, by a mayor, who is elected for two years, and a city council. The water works and electric light plant are owned and operated by the municipality. Pop., 1890, 1334; 1900, 2025; 1910, 1922.

ALBANY. Capital of New York State, the county-seat of Albany County, and an important railroad and commercial city. It is on the west bank of the Hudson River, nearly 6 miles below the head of navigation, 145 miles north of New

York City, and about 200 miles west of Boston (Map: New York, G 3).

A narrow alluvial plain extends along the river, and from this the ground rises sharply to a sandy plateau about 200 feet above tide level, with valleys separating the four ridges into which the slope is divided. The principal streets are Broadway, North and South Pearl streets, which run parallel to the river, and State Street, which runs westward, ascending the face of the hill at a very steep grade. The most striking feature as well as the most important edifice in Albany is the Capitol, which is built of Maine granite, in the Renaissance style. Since its corner-stone was laid, in 1871, it has cost over \$24,000,000. The edifice has been built with the advantage of large ideas and limitless resources, and the disadvantages of a succession of architects with changing views; these circumstances have left their imprint on the structure. But when all has been said in criticism of details, the general plan, and unused possibilities, it must be ranked among the great buildings of the country. Within are rooms for the Assembly, Senate, Court of Appeals, the Governor, and other State officials. Many relics of the Revolution and Civil War are kept in a military museum on the second floor. Facing the Capitol are the State Hall, and the city hall, of reddish granite, with Romanesque doorways and majestic campaniles, while opposite the Capitol, on Washington Avenue, stands the new State Education Building, a notable structure of four stories and basement with imposing marble colonnade, which, besides offices for the Board of Regents and the Department of Education, contains the State Library and the State Museum. The Federal Building, containing the custom house and post-office, is at the foot of State Street, and on the same street, about a block below the Capitol, is the building known as Geological and Agricultural Hall, which formerly housed the State Museum of Natural History, but which since the transfer of that museum to the State Education Building is used exclusively by the State Department of Agriculture. In the residence districts the most important architectural features are the churches, four of which have more than a local interest: the North Dutch Church, St. Peter's Church, "one of the richest specimens of French Gothic in this country," the cathedral of All Saints, and the cathedral of the Immaculate Conception, with lofty double spires and a spacious interior treated with taste and dignity.

Other important buildings are the Union Station, the Hotel Ten Eyck, the Albany Academy, the new High School, the Albany Institute and Historical and Art Society, the Homœopathic Hospital, Harmanus Bleecker Hall, and the State Armory. The third Van Rensselaer manor house, built in 1765, was removed in 1893 to the campus of Williams College at Williamstown, Mass. The old Schuyler mansion, for many years used as an orphan asylum by the Sisters of Charity, was recently purchased by the State and will be used as a museum. Albany is the seat of a State normal college, and contains the law and medical departments of Union University at Schenectady, and also Dudley Observatory, in the southwest corner of the city. Near the latter are the pavilions of the hospital, built in 1899, and of the orphan asylum, built in 1906; and in the same section is the county penitentiary, opened in 1848,

which confines annually between 300 and 400 prisoners, the majority sentenced for short terms.

The city has 402 acres devoted to parks, the largest of which, Washington Park, in the western part of the city, contains a lake 1700 feet long, and two fine bronzes: Calverley's statue of "Robert Burns," and Rhind's statue of "Moses at the Rock of Horeb." In the beautiful Rural Cemetery about 4 miles north of the city is the tomb of President Arthur.

Trade and Transportation. Albany is a terminus of the Boston and Albany Railroad, and the division terminus on the main lines of the West Shore, the New York Central and Hudson River and the Delaware and Hudson railroads. It is thus at the intersection of the great thoroughfares of traffic and travel from Boston and New York to the west and the north. It also has direct steamboat communication by day and night lines with New York and Hudson River points, while by the Erie and the Champlain canals it has water routes to the interior of the State and the west and north. It still remains an important centre of passenger travel, but the great bulk of freight movement now passes the city in through shipments. Manufacturing interests in Albany have increased considerably. The most important industries now include iron, wood, and brass manufactures; printing and engraving; shirt, collar, and cuff manufactures; manufactures of clothing, caps, and knit goods; brewing; tobacco and cigar manufactures; and carriage and wagon building.

The city has about 41 miles of street railways, and electric lines connect also with towns some distance away. There are three bridges across the river to Rensselaer, two of which are used by the railroads and foot passengers, and the third is open for foot and wagon traffic. The water supply is furnished in part by a gravity supply, from a lake 5 miles distant; but a large proportion is pumped from the Hudson River, an improved filtration system having been adopted for the latter supply. There are about 100 miles of paved thoroughfares, some of which are laid with asphalt and brick and creosoted wooden blocks, though most of the important streets are paved with granite blocks and many still have cobblestone pavements.

Administration. As provided by legislative enactment for cities of the second class, the government is vested in a mayor, elected biennially; a city council, the president being elected at large and the aldermen by wards; and administrative departments constituted as follows: *Finance*—comptroller, treasurer, and a board of estimate composed of the mayor, comptroller, corporation counsel, president of the common council, city engineer, and treasurer; *Public Works*—commissioner, who appoints superintendents of water works and parks, city engineer; and a board of contract and supply, composed of the mayor, comptroller, commissioner of public works, corporation counsel, and city engineer; *Public Safety*—commissioner, who appoints chiefs of police and fire departments, with their subordinates, and a health officer and district health physicians; *Public Instruction*—three commissioners of education (term, six years), who appoint the superintendent of schools and teachers; *Assessment and Taxation*—four assessors, two elected every two years for a term of four years; *Charities and Correction*—commissioner, who appoints an overseer of the poor



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and assistants; *Judiciary*—one police court justice who holds office six years, and three city court justices; *Law*—corporation counsel, who appoints an assistant and subordinates. Of these officials, the comptroller, treasurer, assessors, and police and city court justices are elected; all others are appointed by the executive. A sealer of weights and measures is also appointed by the mayor, and supervisors are chosen by popular election.

The annual expenditures of the city amount to over \$3,000,000, the principal items (for maintenance and operation) being about \$187,000 for the police department, \$198,000 for the fire department, \$411,000 for schools, \$400,000 for bureau of water, and \$90,000 for street lighting.

Pop., 1870, 69,422; 1880, 90,758; 1890, 94,923; 1900, 94,151; 1910, 100,253, a gain of but 6.5 per cent in the decade 1900-10.

History. Albany claims to be the second oldest permanent settlement within the limits of the 13 colonies, and has great historical significance on account of its strategic importance during the century of conflict between the English and French in America and in the American Revolution. As early as 1524 the French navigator Verrazano sailed up the Hudson River, and about 1540 a French trading post was set up near the present site of Albany. But this proved only temporary, and the continuous history of the place dates from the effective discovery of the region by Henry Hudson in 1609. Hudson's voyage was followed by Dutch traders, who, in 1614, established a trading station on Castle Island under the name of Fort Nassau. Three years later, the trading post was removed to the mainland. The first actual settlers, however, were 18 Walloon families, who were sent out by the Dutch West India Company in 1623. During the same year Fort Orange, or Aurania, was built, near the site of the present Steamboat Square. Three years later an Indian war broke up the settlement for a time, the families being removed to Manhattan and only a small garrison left in charge of the fort. In 1630 Kiliaen Van Rensselaer bought an extensive tract of land surrounding Fort Orange and sent over settlers from Holland, who rented their land from him as their patroon, or lord of the manor. (See PATROON.) The principal settlement of this patroonship or colony of Rensselaerswyck was located in the immediate vicinity of the company's fort and became the nucleus of the present city. The settlement remained a part of the patroon's colony until 1652, when, after much friction between the patroon's agents and the officials of the company, it was, by a high-handed measure of Director-General Stuyvesant, declared to be independent of Rensselaerswyck and annexed to Fort Orange. The settlement was originally known as the *Fuyck*, or hoop-net, from the converging lines of its streets; afterward it was called Beverwyck, and on the transfer of New Netherland to the English, in 1664, the name of the village was changed to Albany, in honor of the Duke of York and Albany, afterward James II. In 1686 Albany received a city charter from Governor Dongan, providing for an elected council and a mayor to be appointed by the Governor. The first Mayor, Peter Schuyler, continued to serve until 1694. The settlement continued to be inhabited mainly by the Dutch, but the increase in the English population is indicated by the erection of an English church in 1714.

As a frontier town open to Indian attacks, Albany was protected not only by the fort, but by a stockade surrounding the compactly built area. During the French and Indian wars the city was the storehouse for munitions of war, the rendezvous for the troops, and a place of safety for refugees and wounded soldiers. In 1754 there was held at Albany the first general Congress (see ALBANY CONVENTION) of all the colonies, at which plans of union were discussed.

Burgoyne's campaign in 1777 was directed against Albany, as the key to the situation in the north; but the battle of Saratoga preserved this strategic point to the patriots. During the next 20 years Albany was at times the headquarters of the State government; in 1797 it was made the permanent capital of the State, and the first State House was built a few years later.

In 1820 Albany had a population of only 12,630; but the Erie Canal opened a new field for commercial activity and brought a rapid development. By 1840 the population was 33,721, or nearly treble that of 20 years before; by 1860 it had reached 62,367, but since then the increase has been at a slower rate. In 1839 there began the "Anti-Rent War" (see ANTI-RENTISM), the result of an attempt by the Van Rensselaer heirs to collect the quit-rents on the old leases made in the pre-Revolutionary days. Albany has been visited by several disastrous fires, those in 1797 and 1848 being the most destructive. On March 29, 1911, fire destroyed the entire State Library of 500,000 volumes, which was located on the third, fourth, and fifth floors of the west side of the State Capitol. The lower part of the city has often been inundated by spring floods in the river. In 1886 the bicentennial of the incorporation of the city was celebrated with elaborate ceremonies; and on Jan. 6, 1897, the centennial of the selection of the city as the State capital was also commemorated. In 1894 the Delavan House, for 50 years the resort of politicians and eminent men, was burned. See A. J. Weise, *The History of the City of Albany* (Albany, 1884); J. Munsell, *The Annals of Albany* (10 vols., Albany, 1850-59), and *Collections on the City of Albany* (4 vols., Albany, 1865-71); G. R. Howell and J. Tenney, *Bi-centennial History of Albany. History of the County of Albany, N. Y., from 1609 to 1886* (bound with *History of the County of Schenectady*, New York, 1886); C. Reynolds, *Albany Chronicles* (Albany, 1906); and a sketch in L. P. Powell's *Historic Towns of the Middle States* (New York, 1899).

ALBANY. A city and the county-seat of Linn Co., Oreg., 80 miles southwest of Portland, on the Southern Pacific, the Oregon Electric, and the Corvallis and Eastern railroads, and on the Willamette River (Map: Oregon, B 3). It is the seat of Albany College (Presbyterian), opened in 1867, and has a Carnegie library, a hospital, an academy, and many churches. The river, crossed here by a fine steel bridge, furnishes good water power. There are chair, sash, and door factories, sawmills, flouring mills, railroad machine shops, a prune-packing establishment, etc. Flour, grain, lumber, fruit, and sandstone are exported. The surrounding country is rich in timber. Albany was settled about 1850 and was incorporated in 1864. Pop., 1900, 3149; 1910, 4275; 1913 (est. including suburbs), 7500.

ALBANY. A river rising in Lake St. Joseph, in the province of Ontario, Canada. It

flows northeast for a distance of about 400 miles, forming part of the boundary between Ontario and the territory of Keewatin. It is navigable as far as Martin's Falls and empties into James Bay at Fort Albany.

ALBANY, or **AL'BAINN**. An ancient name for Scotland, retained in poetical usage down to our own day. Connected with it is the term "Albiones" applied to the inhabitants of the entire British Islands in Festus Avicenus's account of the voyage of Hamilcar, the Carthaginian, in the fifth century B.C.; also the term "Albion" (q.v.), which appears as the name of the islands in Aristotle's *Treatise of the World*. It may be that Albion, or Albany, was the original name of Britain among its Celtic population, and that it only became restricted to the provinces of Scotland north of the firths of Clyde and Forth when the Celts had for the most part become confined to the same region. The modern use of the name "Albany" may be said to have taken its rise in an act of a Scottish council, held at Scone, in June, 1398, when the title of Duke of Albany was conferred on the brother of King Robert III, then acting as regent of the kingdom. The title, being forfeited in the grandson of the first holder, was afterward conferred on Alexander, second son of King James II, in the person of whose son, John, it became extinct in 1536. Subsequently it was conferred on Lord Darnley, and after him on a number of princes of the royal family. Prince Charles Stuart assumed the appellation of Count of Albany as an incognito title and gave the title of Duchess of Albany to his legitimated daughter. The title was restored in 1881 and conferred upon Prince Leopold, and after his death upon his son, who later became Duke of Saxe-Coburg.

ALBANY CONVENTION OF 1754. In 1754, when hostilities were about to begin between the French and English in America, the lords of trade recommended that an inter-colonial convention be called to "confirm and establish the ancient friendship of the Five Nations" and consider plans for a permanent union among the colonies. On June 19 commissioners from Massachusetts, Connecticut, New Hampshire, Rhode Island, Pennsylvania, Maryland, and New York assembled at Albany, and, after arranging for the participation of the Indians in the war, adopted, with some modifications (July 11), a plan of intercolonial union proposed by Franklin. This plan provided for the appointment by the crown of a president-general, who was to nominate military officers, commission all officers, and have veto power over the acts of the Grand Council; and for a Grand Council, to be made up of representatives chosen by the legislature of each colony every three years, no colony to have more than seven members nor less than two. This council was not to be prorogued, dissolved, or kept in session longer than six weeks against its consent, and, with the approval of the president-general, was to manage Indian affairs, authorize new settlements, nominate all civil officers, impose taxes, enlist and pay troops, and construct forts, all of its acts to be valid unless vetoed by the crown within three years. The plan was everywhere rejected—by the court and the royal governors, because it gave too much power to the colonies; by the colonies, because it gave too much power to the king. It is notable as being the first comprehensive scheme of union formally proposed to the various colonial governments in

America. Consult *New York Colonial Documents*, vol. vi, and R. Frothingham, *Rise of the Republic* (Boston, 1872).

ALBANY, DUKE OF. See LEOPOLD, GEORGE DUNCAN ALBERT.

ALBANY, DUKE OF. In Shakespeare's *King Lear* (q.v.), the husband of Lear's daughter Goneril (q.v.).

ALBANY, LOUISA MARIA CAROLINE, also **ALOYSIA, COUNTESS OF** (1753–1824). She was the daughter of a minor German prince, and the wife of Charles Edward Stuart, the Young Pretender, to whom she was married for reasons of dynastic policy. Her husband, unable to win recognition of his royal title, called himself the Count of Albany, and he and his Countess led an unhappy and childless existence, wandering aimlessly from one Italian city to another. The Count drank heavily. His wife met Alfieri, the tragic poet of Italy. She fled from her husband, sought refuge with her brother-in-law, Cardinal Yorke, and incidentally saw much of Alfieri. On the death of her husband she and the poet lived openly together in Florence, their great love immortalized in literature by his world-famous pen. He died in 1803, and the grief-stricken widow commissioned the great sculptor Canova to carve his tombstone. The Countess, however, found solace in society. She became the friend of Madame de Staël and opened a brilliant salon in Florence, which, except for a brief period when she was forced to Paris by the jealousy of Napoleon, she maintained till her death. Among those who frequently visited her were Byron, Lord John Russell, Lamartine, Chateaubriand, and Cardinal Consalvi. She and Alfieri are buried together in the church of Santa Croce at Florence, between the tombs of Machiavelli and Michelangelo. Consult: Lee, *The Countess of Albany* (London, 1884); Cerro, *Vittorio Alfieri e la contessa d' Albany* (Torino, 1905); Vaughan, *The Last Stuart Queen* (New York, 1911).

ALBANY RE'GENCY, THE. A name popularly given to a group of New York Democrats living at Albany, who, from 1820 to about 1850, controlled the nominating conventions and patronage of their party within the State and by dictating its general policy exerted a powerful influence in national as well as State politics. They derived their power largely from their great personal influence and remarkable political sagacity and were, for the most part, earnest opponents of political corruption, though they uniformly acted upon the principle, first formulated in 1833 by one of their number (Marcy), that "to the victors belong the spoils." Among those who at various times were members of this unofficial body were Martin Van Buren, William L. Marcy, Silas Wright, John A. Dix, Edwin Croswell, Benjamin F. Butler, A. C. Flagg, Dean Richmond, and Samuel A. Talcott, several of whom "graduated" from it into high offices under the national government. The Regency's loss of prestige dated from about 1848, when their opponents adopted methods similar to their own, and the Democratic party in the State split into irreconcilable factions. (See BARNBURNERS.) Consult Alexander, *A Political History of the State of New York* (2 vols., New York, 1906), and Morgan Dix, *Memoirs of John A. Dix* (New York, 1883).

ALBA POMPEI'A. A town of ancient Italy, in Liguria. See ALBA.

AL'BATEG'NIUS. See AL-BATTANI.

AL'BATROSS (corrupted from Portug. *alcatraz*, the pelican, from Ar. *al*, the + *câdous*, bucket, referring to its supposedly water-carrying pouch). A popular name for the large marine birds of the family Diomedidæ, closely related to the petrels (q.v.). Albatrosses are among the most exclusively pelagic birds known. They occur on nearly all parts of the ocean, except the north Atlantic, and even there, owing to their extraordinary power of flight, they are



BEAK OF AN ALBATROSS

occasionally seen. Like the petrels, albatrosses have the hind toe, or hallux, reduced to a mere claw, or entirely wanting, while the other three toes are fully webbed. The nostrils also open at the ends of nearly cylindrical, horizontal tubes, a character upon which the order Tubinares is based. Albatrosses differ from petrels, however, not only in their great size, but also in having the nostril tubes placed one on each side of the bill, at its base, instead of close together on top. The bill of an albatross is a heavy and powerful structure, four inches long or more, and strongly hooked at the tip. The covering consists of several distinct plates of horn. The plumage of the body is very thick and compact and well adapted to withstand not only water but cold. Experiment has shown that an albatross can withstand a temperature far below freezing for weeks at a time, even when confined, so that active movement is impossible. The tail is comparatively short and more or less rounded, but the wings are exceedingly long and pointed. The great length of wing is largely due to the unusual length of the humerus and the radius and ulna. Owing to this great length of upper arm and forearm, the number of flight-feathers carried on the wing exceeds that of any other known bird, the number of secondaries being about 40. As might be supposed from their size, albatrosses are very voracious. Their food is all gathered from the surface of the sea, as they do not dive. Fishes, pelagic mollusks, and other floating animal matter, including the offal of vessels, compose the food of these birds, and they may be caught from a vessel with hook and line baited with salt pork. Their power of flight is very remarkable, and they occasionally follow vessels for days at a time. Because of this habit, and because they are almost the only visible inhabitants of the wastes of the southern oceans, sailors regard them with superstitious affection, and it is considered a forerunner of most serious misfortune to kill an albatross. This fact has passed into literature in Coleridge's *Rime of the Ancient Mariner*. The best modern description of the bird is in Froude's *Oceana*. Albatrosses seldom visit land, and then only remote antarctic and oceanic islands, to breed. Often no nest is made, but the single egg is dropped on the bare earth. The egg is large and white, and somewhat ellipsoidal in shape.

The number of forms of albatross is still doubtful, but it is probably about 17. Of these all but seven are placed in the genus *Diomedea*. The largest, and perhaps the best known, species is the wandering albatross (*Diomedea exulans*), which is found throughout the southern oceans and occasionally strays to Europe and possibly to Florida. The plumage of the adult is chiefly white, but the larger wing-coverts and part of the back are more or less barred with black. The young are dusky, lighter on the lower parts. This species is about 4 feet in length, and 10 to 14 feet in extent of wings. On the Pacific coast of North America occur four species, of which the short-tailed (*Diomedea albatrus*) and the black-footed (*Diomedea nigripes*) are fairly common. They are rather small for albatrosses, only 3 feet long and about 7 feet across the wings. Another species of about the same size, widely distributed over the Pacific Ocean, is the sooty albatross (*Phœbetria fuliginosa* or *palpebrata*), the only member of its genus. These three species are easily distinguished by their color: The short-tailed albatross is white, with dark wings and tail and flesh-colored feet; the black-footed is dark chocolate-brown, whitening on the head, and the feet are black; while the sooty albatross is uniform sooty-brown, with light-colored feet. The last species also has a wedge-shaped tail and a slender bill. The yellow-nosed albatross (*Diomedea chlororhyncha* or *Thalassogeron chlororhynchus*), so called from the color of the bill, is a well-known southern species. All these small forms are known to sailors as "mollymawks." See Plate of AUKS, ALBATROSSES, ETC.

AL-BATTA'NI, MOHAMMED IBN JABIR IBN SINAN, known as ALBATEGNIUS (so called from Batan in Mesopotamia) (c.850-929). An Arab chief, one of the most famous astronomers and mathematicians of his race. His first astronomical observations were made at Rakka (877-878) and extended over a period of more than 40 years. He also made several important contributions to pure mathematics. He used the sine of an angle in place of the chord of double the angle (an idea that had occurred to Aryabhata), computed a table of cotangents, and formulated certain propositions in spherical trigonometry. His astronomical works were first made generally known to European scholars through a translation by Plato of Tivoli, under the title *Mahometis Albatanii de Motu* (or *Scientia*) *Stellarum*. This work has been edited in Arabic and Latin by C. A. Nallino (Milan, 1899). Al-Battani corrected numerous errors of Ptolemy, whom, in general, he followed; e.g., he gave the obliquity of the ecliptic as $23^{\circ} 35'$ instead of $23^{\circ} 51' 20''$. He also gave the length of the tropical year as 365 days, 5 hours, 46 minutes, 24 seconds; too short by 2 minutes, 26 seconds, but an improvement upon that of Hipparchus, who gave $365\frac{1}{4}$ days $- \frac{1}{300}$ day, which was too short by 4 minutes, 48 seconds.

ALBAUGH, ăl'bô, JOHN W. (1837-1909). An American actor and manager. He was born Sept. 30, 1837, at Baltimore, where he made his first appearance as Brutus in a play called *Brutus, or the Fall of Tarquin* (1855), on a stage managed by Joseph Jefferson. Of his many subsequent impersonations, perhaps the best known was that of Louis XI, at what later became Daly's Theatre, in New York. After 1868 he was manager of theatres in St. Louis, New Orleans, and Albany, and for a number of years

in Washington and Baltimore, where he owned the new Lyceum. He retired from the stage in 1899. Much of his subsequent leisure years was devoted to his noted stock farm near Washington. Consult Clapp and Edgett, *Players of the Present*, Dunlap Society, publishers (New York, 1899).

ALBAY, ăl-bî'. A province and a town of Luzon, one of the Philippine Islands. The province takes in the southeast end of the island and contains an area of 997 square miles and a population (1903) of 240,326 (Map: Philippine Islands, H 6). The surface is rugged, bears traces of volcanic origin, and the province has several extinct volcanoes and the active volcano of Mount Mayon, 8504 feet high. It is well watered and has good roads. A considerable part is covered by thick forests, full of good timber and game. The province contributes about one-fourth of the total hemp export of the Philippines. The production of oil from the cocoanut, the manufacture of boats, and the mining of coal are among the other industries. Gold and silver are found in small quantities. The chief city is situated near the eastern coast, on the Bay of Albay. It has a good harbor and is the seat of a considerable trade. Pop., 1903, 14,049.

ALBE'DO (Lat. whiteness). In astronomy, the reflecting power of a planet's surface. The quantity of reflected solar light received by us from any given planet depends, of course, on the character of that planet's surface. If it were like polished silver, for instance, the albedo would be very high; much higher, indeed, than the power actually possessed by the surface of any known planet. Astronomers designate the albedo of any planet by means of a fraction indicating the ratio of light reflected to the total quantity of light received. Thus the moon's average albedo is 0.17, which means that about one-sixth of the light received by the moon from the sun is again reflected. According to Müller, who made extended observations on the light of the planets at Potsdam from 1885 to 1893, the albedo of Mercury is 0.17; of Venus, 0.91; of Mars, 0.27; of Jupiter, 0.74; of Saturn, 0.87; of Uranus, 0.72; and of Neptune, 0.63.

ALBEE, ERNEST (1865—). An American scholar and educator, born in Langdon, N. H. He graduated from the University of Vermont in 1887 and after post-graduate courses at Clark and Cornell universities, received the degree of Ph.D. from the latter in 1894. In 1892 he was appointed instructor; in 1902 assistant professor; and in 1907 professor of philosophy in Cornell University. From 1903 to 1908 he was editor of *The Philosophical Review*. He wrote *A History of English Utilitarianism* (1902) and many articles on philosophical subjects.

ALBEMARLE, first DUKE OF. See MONK or MONCK, GEORGE.

AL'BEMARLE, THE. A Confederate ram, which, after doing great damage to the Federal shipping, was blown up and completely destroyed on the night of Oct. 27, 1864, by W. B. Cushing. See CUSHING, W. B.

ALBEMARLE, or ISABELA, ISLAND. The largest of the Galapagos Islands (q.v.), lying between lat. 0° 15' N. and 1° 5' S., and long. 90° 50' W. and 91° 45' W. It is of volcanic origin and irregular in form, its greatest length about 90 miles and its greatest breadth about 50. The surface, which covers an area of 1650 square miles, is elevated, reaching an alti-

tude of 4700 feet. Albemarle Point is the northernmost extremity of the island.

ALBEMARLE SOUND. An inlet in the coast of North Carolina, nearly 60 miles long and 4 to 15 miles wide, separated from the ocean by an island and not appreciably affected by the tides (Map: North Carolina, F 1). It receives the Roanoke, Chowan, Perquimans, Little, and Pasquotank rivers, and is connected with Currituck and Croatan sounds, the latter of which flows into Pamlico Sound. It is about 12 miles in length, and its greatest depth is 18 feet. It is so shallow in some places that it is of little value for navigation.

ALBENGA, ăl-ben'gä. A seaport and episcopal see of Liguria, Italy, 52 miles by rail southwest of Genoa and on the Gulf of Genoa. The sea-coast line has receded, and its harbor has disappeared. This town is the site of the Roman Albingaunum, which was the chief town of the Ingauni. Many ruins are visible in the vicinity, the most important of which are the old town walls and a bridge. The modern town is reputed to be the quaintest on the Riviera and contains a Gothic cathedral, the châteaux of Italian nobles, the chapel of Santa Maria, and an interesting leaning tower. Pop., 1901, 6250; 1911, 6882.

ALBENIZ, ăl'bä-nëth', ISAAC (1860-1909). A Spanish pianist and composer. He was born at Camprodon. His musical precocity almost equaled that of Mozart, so that at the age of six he was accepted as a pupil by Marmontel. After two years of study his father took him on concert tours through Europe and America, but soon realized the necessity of further serious study. The boy then took the regular course at the conservatory at Brussels, where he continued the piano under Brassin and studied composition under Dupont and Gevaert. This course he supplemented further by instruction from Jadasohn, Reinecke, and Liszt. As a concert pianist he soon made a great reputation and was appointed court pianist to the King of Spain. He wrote an oratorio *Cristo*, many zarzuelas (q.v.), and the operas *The Magic Opal* (1893), *Enrico Clifford* (1895), *Pepita Jimenez* (1896). The number of his compositions for piano is over 200. In his latest works he shows to a marked degree the influence of Debussy.

ALBER, ăl'bër, MATTHÄUS (1495-1570). A German theologian, one of the promoters of the Reformation. He was born at Reutlingen, near Stuttgart, was educated at Tübingen, and in 1521 returned to preach in Reutlingen, where he introduced the Reformation. He rejected Latin and used the native tongue in church services, put out the images, and took a wife. He was summoned before the imperial chambers and charged with nearly 70 distinct heresies, to all of which, save that of speaking disrespectfully of the mother of Christ, he confessed guilty. He was tried, but set free without punishment. Alber was a friend and ally of Luther. He has been called, indeed, the "Luther of Swabia," because of the great part he played in that country. Some of his sermons, a catechism, and a work on *Providence* have been published. For his life consult J. Hartmann (Tübingen, 1863).

ALBERDINGK THIJM, ăl'bër-dink tīm, JOSEPHUS ALBERTUS (1820-89). A Dutch author, born at Amsterdam. In 1876 he was appointed professor of æsthetics in the Art Academy at Amsterdam. From 1852 he edited the *Volks-almanak voor Nederlandsche Katholicken*, and

from 1855 *De Dietsche Warande*, devoted to the art and literature of the Middle Ages. He published newspaper criticisms, *Drie Gedichten* (1844), *De Klok van Delft* (1846), *Palet en Harp* (1849), *Verspreide Verhalen in Proza* (3 vols., 1879-83), and other volumes. His prose fiction is considered his best work. A five-volume edition of his writings was printed in Amsterdam (1909). Consult the biography by Van der Duys (Amsterdam, 1889); also, a biography based on Alberdingk's letters, by his daughter (Amsterdam, 1896).

ALBERIC I, ăl'bēr-ik (died 925). An adventurer, of Lombard extraction, who appeared in Rome in 889. He soon joined his fortunes with those of Berengar (q.v.), became Margrave of Camerino, and later Duke of Spoleto. He married Marozia (q.v.) before 915, and in 916 joined John X in expelling the Saracens, who had terrorized Italy for more than 30 years. For his services he was probably made "Consul of the Romans." Nothing definite is known of his later years; but he is said to have ruled Rome despotically for a time, to have been driven from the city; to have summoned the Hungarians to his aid, and to have been slain by the Romans about 925.

ALBERIC II (?-954). The son of Alberic I and Marozia. In 932 he led the Romans in a successful attempt to achieve their independence of Hugo, King of Italy, and was elected "prince and senator of all the Romans." Until his death, in 954, he ruled the city absolutely, but wisely and moderately. He was succeeded by his son Octavian, who became Pope, as John XII, in 955.

ALBERONI, ăl'bâ-rō'nê, GIULIO, CARDINAL (1664-1752). An Italian prelate, minister of Philip V of Spain. He was the son of a poor vine-dresser and was born at Firenzuola, in Parma. From a chorister in a church at Piacenza, he quickly rose, through his abilities, to the dignity of chaplain and favorite of Count Roncovieri, Bishop of San Donino. After some diplomatic service in Italy and a visit to Paris, he was sent by the Duke of Parma as chargé d'affaires to Madrid, where he speedily gained the favor of Philip V. He brought about the King's marriage to Elizabeth Farnese, overthrew the powerful Countess Orsini, and rapidly became Grandee, Cardinal, and Prime Minister (1717). Into the languid body of moribund Spain he infused new energy, invigorated her government, revived her commerce and her manufactures, reconstructed her army, rebuilt her fleet. But Alberoni was ambitious, and in order to gratify the covetous desires of Elizabeth Farnese, he suddenly invaded Sardinia, in violation of the Peace of Utrecht, cherishing the hope of reëstablishing the monarchy of Charles V and Philip II, and startling Europe by his insolent audacity. The regent of France broke off his alliance with Spain and united himself with England and Austria. Alberoni was not dismayed. Even when the Spanish fleet in the Mediterranean was destroyed by an English one, he contemplated an extensive war by land, in which all the European powers were to have been entangled. He patronized the Pretender, to annoy England, and the French Protestants, to annoy France. He sought to unite Peter the Great and Charles XII with him, to plunge Austria into a war with the Turks, and to stir up an insurrection in Hungary; and, through his influence with one of the parties at the French

court, he actually accomplished the arrest of the regent himself (the Duke of Orleans). But so universal became the complaints against Alberoni that Philip lost courage, and made peace, agreeing to the dismissal of the Cardinal. In 1719 Alberoni received a command to quit Madrid within eight days and the kingdom within three weeks. Exposed to the vengeance of every power whose hatred he had drawn upon himself, he knew no land where he could remain. Not even to Rome could he venture, for Clement XI was more bitterly inimical to him than was any secular potentate. He wandered about in disguise and under fictitious names. At length he was imprisoned in the Genoese territory, through the solicitation of the Pope and the Spanish monarch; but he speedily recovered his liberty, and two years after the death of Clement, was reinstated by Innocent XIII in all the rights and dignities of a Cardinal. In 1740 he retired to Piacenza, where he died 12 years after, at the age of 88. He bequeathed his possessions in Lombardy to Philip V, while his cousin and heir, Cesare Alberoni, became possessor of 1,000,000 ducats. Consult: Rousset, *Histoire du Cardinal Alberoni* (The Hague, 1719; Eng. trans., London, 1719); Bourgeois, *La Jeunesse d'Alberoni* (Paris, 1900); and "Cardinal Alberoni: An Italian Precursor of Pacifism," in *American Journal of International Law*, vol. vii (New York, 1913).

ALBERS, ăl'bērs, JOHANN FRIEDRICH HERMANN (1805-67). A German physician, professor of pathology at Bonn. He established there an asylum for the treatment of insanity and nervous diseases, and in 1856 he was director of the pharmacological cabinet. His atlas of pathological anatomy (1832-62) and books on various branches of medical science were regarded as standard works and are still useful and interesting.

ALBERT, ăl'bērt; *Ger. pron.* ăl'bērt. In Goethe's *Sorrows of Werther* (q.v.), the husband of Lotte, with whom Werther is in love. The character is said to have been taken from that of Goethe's friend Kestner.

ALBERT, *Ger.* **ALBRECHT**, ăl'brēkt. The name borne by five archdukes of Austria, of whom two (I and V) were also emperors of Germany.—**ALBERT I**, Archduke of Austria and Emperor of Germany, was the eldest son of Rudolph of Hapsburg and was born c.1250. Rudolph, before his death, endeavored to have Albert appointed as his successor in the Empire; but the Electors, already aware of the tyranny of Albert, refused to comply. After the old King's death Austria and Styria revolted; but Albert, having vigorously crushed the rebellion, turned his attention toward the Empire. The Archbishop of Mainz, an instrument of the Pope, secured the privilege of appointing the imperial candidate and named his cousin, Adolphus of Nassau, in 1292. Albert took the oath of allegiance and quietly awaited developments. In 1298 Adolphus, who had disgusted his subjects, was deposed, and Albert was elected. He was obliged to fight for the new honor and met his rival in a battle near Worms, in which Adolphus was defeated and slain. Albert was crowned at Aix-la-Chapelle in August, 1298; but Pope Boniface VIII denied the right of the princes to elect Albert and refused to recognize him. Albert, however, made an alliance with Philip the Fair of France and, securing the neutrality of Saxony and Brandenburg, invaded the Electorate of Mainz and forced the Archbishop to make an

alliance with him, thus securing a former ally of the Pope. Boniface was alarmed by his success and entered into negotiations with him. As a result, Albert broke his alliance with Philip, recognized the supremacy of the Pope, and promised to defend the rights of the Roman court whenever called upon. Boniface then excommunicated Philip, and offered the throne to Albert in 1303; but Philip soon retaliated by getting the Papacy under the power of the French crown. After this Albert fought unsuccessfully against Holland, Zealand, Friesland, Hungary, and Thuringia. In January, 1308, news arrived of a rebellion among the Swiss in Unterwalden, Schwyz, and Uri, and the Emperor seized this pretext to subjugate the country. An act of injustice, however, occasioned a crime which put an end to his life. His nephew, Duke John, claimed Swabia as his rightful inheritance, but had urged his claims in vain. When Albert was departing for Switzerland, John renewed his demands, but was refused, and so he resolved to be revenged. He conspired against his uncle's life and assassinated him on the road to Rheinfelden, while separated from his followers by the river Reuss. The Emperor expired, May 1, 1308, in the arms of a beggar woman. Albert left six sons and five daughters, the children of his marriage with Elizabeth, daughter of the Count of Tyrol. The story of William Tell is connected with Albert I. See Mücke, *Albrecht I von Habsburg* (Gotha, 1866). ALBERT V (as German king, Albert II) was born in 1397 and inherited the duchy of Austria while still a child. After receiving what was for the times an excellent education, he assumed direct control of the government in 1411. In 1422 he married the daughter of the Emperor Sigismund, and on the death of the latter, in 1437, succeeded, by election, to the crowns of Hungary and Bohemia. In March, 1438, he was elected King of Germany. Wars with the Turks and disorders in Bohemia and Hungary disturbed his short reign. He died Oct. 27, 1439. See Altmann, *Die Wahl Albrecht II zum römischen Könige* (Berlin, 1886).

ALBERT (?-1412). Duke of Mecklenburg and King of Sweden, a son of Duke Albert I of Mecklenburg. Within a year after he was proclaimed King of Sweden (1364) he was compelled to fight against his uncle, Magnus II, whom he defeated and captured at the battle of Enköping. Hakon of Norway, a son of the latter, who had also disputed the right of succession, fled after the battle, but was compelled to sign a treaty of peace in which he renounced all claims to the throne. The victory, however, was bought at the price of great concessions to the Royal Council, and Albert could find no support among the people, who were heavily burdened with taxes. Consequently an attempt to restore his power failed, and Margaret, widow of King Hakon of Norway, was invited to the throne. Albert was defeated and captured at the battle of Falköping (Feb. 24, 1389), and was not liberated until 1395, when he formally resigned all rights to the crown, and retired to Mecklenburg, which, as Duke Albert II, he ruled until his death. See MARGARET (1353-1412).

ALBERT (1490-1568). The last Grand Master of the Teutonic Order and first Duke of Prussia. He was the son of the Margrave Frederic of Ansbach, who wished him to enter the Church. He was educated under the care of Archbishop Hermann, of Cologne, where he became a canon.

He did not, however, neglect knightly exercises. He accompanied the Emperor Maximilian I in his expedition against Venice and was present at the siege of Pavia. In 1511, when scarcely 21 years old, he was chosen Grand Master of the Teutonic Order, the knights expecting their feudal allegiance to Poland to be abolished on account of his near relationship to Sigismund, the monarch of that country, while they also hoped for protection against the Poles from his friends in Germany. He was consecrated at Mergentheim with his father's consent. In 1512 he removed to Königsberg, having been acknowledged by Poland likewise; but, refusing to take the oath of allegiance, he was plunged into a war with Sigismund in 1520. The year after, a four years' truce was agreed to at Thorn. Albert next made his appearance at the Imperial Diet at Nuremberg as a German prince of the Empire, to induce the other princes to assist him against the Poles. But Germany could at that time grant no assistance to any one. Disappointed in his hopes, Albert threw himself into the cause of the Reformation, which had rapidly spread into Prussia and broken the last strength of the declining order, whose possessions now appeared a certain prey to Poland. He still hoped to preserve these by acting upon Luther's advice to declare himself secular Duke of Prussia and place his land under the sovereignty of Sigismund. This was done with great pomp at Cracow in April, 1525, the duchy being secured to him and his descendants. During the remainder of his life Albert zealously sought to further the welfare of his duchy. He regulated the administration of all affairs, both secular and ecclesiastical, established the ducal library, founded in 1544 the University of Königsberg, gathered many literary men around him, and caused their works to be printed. In 1527 he married Dorothea, daughter of Frederick, King of Denmark. Albert earnestly desired peace, but found himself entangled in conflicts with the nobles and in theological disputes, which, along with other troubles of a more personal character, saddened the close of his life. Consult Lohmeyer, *Herzog Albrecht von Preussen* (Dantzic, 1890); and for the part played by Albert in the Reformation, Tschakert, *Herzog Albrecht von Preussen* (Halle, 1894).

ALBERT (1559-1621). Archduke of Austria. He was the sixth son of the Emperor Maximilian II. He was brought up at the Spanish court and dedicated himself to the Church. In 1577 he was made Cardinal, in 1584 Archbishop of Toledo, and during the years 1594-96 held the office of Viceroy of Portugal. He was next appointed Stadtholder of the Netherlands. In 1598 he resigned his ecclesiastical offices and left the Church, and married the Infanta Isabella, receiving with her the Netherlands and Franche Comté. Had it been possible to regain by any means Spain's rebellious provinces, Albert's mild character and conciliatory policy might have done so. As it was, he became engaged in constant warfare prosecuted with little success and marked by bitter feeling on both sides. Later in life he became fanatic, priest-ridden, and in a measure incapable of efficient rule. (Consult Dubois, *Histoire d'Albert et d'Isabelle* (Brussels, 1847), and Schmolke, *Albert und Isabella* (Berlin, 1878).)

ALBERT (1490-1545). Archbishop of Magdeburg and Elector of Mainz, generally called Albert of Brandenburg. He was the younger son

of the Elector John Cicero of Brandenburg, and was born in Brandenburg, June 20, 1490. In 1513 he became Archbishop of Magdeburg, and also administrator of the bishopric of Halberstadt, and in the next year Archbishop and Elector of Mainz. He was put in charge of the preaching, within a certain district, of the jubilee indulgence granted by Leo X, on the condition that one-half the proceeds was to be sent to Rome. He appointed the Dominican Tetzl sub-commissioner in the work, whose preaching gave occasion to Luther to post up his well-known 95 theses. He was made a Cardinal in 1518. Even in the Archbishop's own diocese the reformer's doctrines found not a few adherents, so that Albert was compelled at the Imperial Diet at Augsburg (1530) to act the part of peacemaker. When he joined the holy alliance against the League of Schmalkalden, Luther made a fierce attack on him in writing. He was the first of all the German princes who received the Jesuits into his dominions. In 1541 he granted religious liberty to his subjects, under the condition that they should pay his debts, amounting to 500,000 florins. He died at Mainz, Sept. 24, 1545. For his life consult J. May (Munich, 1865-75), and Redlich, *Albert und das Neue Stift zu Halle* (Mainz, 1900).

ALBERT, called ACHILLES (1414-86). Elector of Brandenburg, third son of Friedrich I and Elizabeth of Bavaria. He was born at Tangermünde and after the death of his father, in 1440, succeeded to the margraviate of Ansbach, where, together with several other feudal lords, he soon came into conflict with the inhabitants of the cities of South Germany, which were united against him. In 1449 he attacked Nuremberg, but was defeated at Pilsen and compelled to effect a permanent compromise (1453). By the death of his brother John he succeeded to the margraviate of Bayreuth, and in 1470 his brother Friedrich II transferred to him the margraviate of Brandenburg and the electoral dignity. He was fond of display and amusements and was distinguished by an enlightenment far in advance of his age.

ALBERT, called ALCIBIADES (1522-57). A margrave of Brandenburg, who was born at Ansbach. Although reared in the Protestant faith, his military enthusiasm and love of power induced him to serve in the army of Charles V, and he fought in the campaign against France in 1543. Afterward he conspired against the Emperor with Maurice of Saxony and several other princes, and was personally instrumental in arranging the Treaty of Chambord with Henry II of France (Jan. 15, 1552). In consequence of differences with his confederates, he subsequently again embraced the cause of Charles, who ratified his territorial claims. In an endeavor to carry these into effect, however, Albert was twice defeated (July 9 and Sept. 12, 1553). He was soon afterward outlawed by the Emperor and fled to France (1554). He died in 1557, shortly after his return to Germany.

ALBERT, à'l'bâr', ALEXANDRE MARTIN (1815-95). One of the leading members of the provisional government of France after the revolution of February, 1848. Though a poor mechanic, he took great interest in the political questions of his time and participated in the revolutions of 1830 and 1848. While keeping at his trade, he edited a workingman's paper, started in 1840, called *L'Atelier*. He was sum-

moned by Louis Blanc from his shop, where he was making buttons, to the presidency of the committees on the national workshops and national rewards, but presently resigned and entered the Assembly. For his participation in the attempt of May 15, 1848, to overthrow the government, he was condemned to imprisonment for life, but was pardoned in 1859 by Louis Napoleon. During the commune (1871) Albert played a part of some prominence, but from that time to his death he gradually lost both influence and prestige. He was known in French politics as *L'ouvrier Albert*.

ALBERT, à'l'bêrt, ARISTIDES ELPHONSO PETER (1853—). A bishop of the Methodist Episcopal Church, South, and also a practicing physician and surgeon. His father was a Frenchman, his mother a slave, and he was born in St. Charles parish, Louisiana. Freed by the war, he removed with his mother to New Orleans. He graduated in arts and theology at Straight University, New Orleans, and in medicine at New Orleans University (1892). After holding various appointments in the Methodist Episcopal Church, South, including that of editor-in-chief of the *Southwestern Christian Advocate* (five years) and the presidency of Gilbert College, Baldwin, La. (1896-1900), he became pastor of Wesley Chapel, New Orleans (1900-02). He represented his conference in the Ecumenical Conference in London in 1901.

ALBERT, called THE BOLD (1443-1500). Duke of Saxony, founder of the Albertine line. He was a younger son of the Elector Frederick, called "the Gentle." From 1464 he reigned conjointly with his brother Ernest, who had been invested with the electoral dignity and gradually obtained such valuable accessions of territory in Thuringia and elsewhere that a separation into the Ernestine and Albertine branches became necessary. At the Reichstag held at Freiburg, in 1498, he was appointed "hereditary governor and potentate" of Friesland. A magnificent bronze monument was dedicated to him at Meissen in 1876.

ALBERT, COUNT OF BOLLSTÄDT (c.1193-1280). A German philosopher, usually called Albertus Magnus, and styled *Doctor Universalis*, who was distinguished for the extent of his acquirements and for his efforts to spread knowledge, especially of the works and doctrines of Aristotle. He was born at Lauingen, in Swabia, probably in 1193, but the date is disputed. After studying principally at Padua, he entered the order of the Dominican friars in 1223 and taught at Regensburg, Bologna, Strassburg, Freiburg, Hildesheim, and Cologne, where Thomas Aquinas became his pupil. He afterward repaired to Paris, where he expounded the doctrines of Aristotle. In 1254 he was appointed Provincial for his order in Germany and undertook the reform of the monasteries. Through his interest in their libraries he added to his already great sum of knowledge. He defended the mendicant orders against the attacks of the University of Paris, and, at the same council, discussed the errors of Averroës. In 1259 he was relieved by Pope Alexander IV of the task of Provincial, but only that he might take the bishopric of Ratisbon. But in 1262 he retired to a convent at Cologne to devote himself to literary pursuits. Here he composed a great number of works, especially commentaries on Aristotle. In 1270 he left Cologne to travel through Bavaria and France, preaching a crusade. In 1274 he attended a council at Lyons, and on the way back

defended publicly at Paris some of the works of his favorite pupil, Thomas Aquinas. He died Nov. 25, 1280, leaving his greatest work, the *Summa Theologiæ*, incomplete. The fullest edition of his works was prepared by Jammy (21 vols., Lyons, 1651), but it is uncritical and far from complete. Many of the writings attributed to him seem to be spurious. He was the greatest student of Aristotle which scholasticism had up to his time produced. He held an inclusive theory regarding the dispute of nominalism and realism; that universal ideas are prior to particulars, being original types in the Divine mind; are in things, since they are the common basis of the class of things; and after things, for our minds deduce them from particular things. He recognized the difference between natural and revealed religion and abandoned the idea of deducing special doctrines, like the Trinity, from reason. He held that all things in philosophy are true in theology, but that beyond the knowledge gained from philosophy is a realm where the mind must depend upon revelation. Revelation is above reason, but not contrary to reason. The extensive chemical and mechanical knowledge which Albert possessed, considering the age in which he lived, brought upon him the imputation of sorcery, and in German tradition he has a very ambiguous reputation. It is related, for instance, that in the winter of 1240 he gave a banquet at Cologne to William of Holland, King of the Romans, and that during the entertainment the wintry scene was suddenly transformed into one of summer bloom and beauty. This myth may rest on the fact that Albert had a greenhouse. The scholastics who followed Albert's opinions took the name of Albertists. His best-known works are *Summa Theologiæ* and *Summa de Creaturis*. For his life, consult Sighart (Regensburg, 1857; English translation by Dixon, London, 1876). For his philosophy, consult Erdman, *History of Philosophy*, vol. i (London, 1890).

ALBERT, COUNT OF GEIERSTEIN, gī'ēr-stīn. In Scott's novel, *Anne of Geierstein* (q.v.), the head of the "Secret Tribunal." At various times he appears in monkish disguise; later he slays Charles of Burgundy in battle.

ALBERT, ä'l'bërt; Ger. pron. ä'l'bërt, EDUARD (1841-1900). An Austrian surgeon. He was born at Senftenberg, in Bohemia, and studied medicine at Vienna. In 1873 he was made professor of surgery at Innsbruck. From 1881 until his death he was clinical professor of surgery at Vienna. His published works include *Beiträge zur Operativen Chirurgie* (1878-80), *Diagnostik der Chirurgischen Krankheiten* (7th ed., 1896), and a text-book of surgery in four volumes, which has passed through several editions. Albert's original researches resulted in valuable contributions to surgical diagnosis, to operative surgery, and to other branches of medical knowledge.

AL'BERT, Fr. pron. ä'l'bâr', EUGEN FRANCIS CHARLES D' (1864—). A pianist and composer; born at Glasgow, April 10, 1864; the son of Charles d'Albert, a French musician and dancing-master, who was his first teacher. He studied in the National Training School, London, under Sir Arthur Sullivan, Prout, and Pauer, and in 1881 gained the Mendelssohn scholarship; under Hans Richter in Vienna and under Liszt in Weimar. In the same year he made his first appearance at a philharmonic concert in Vienna with brilliant success. He was soon made court pianist in Weimar, trav-

eled in Europe, and came to America in 1892-93 and 1904-05. His interpretations of Bach and Beethoven have been generally deemed the most forceful heard in recent years. His mastery of technic, intellectual grasp, force, and fire place him among the most eminent pianists of the world. His compositions include two concertos for piano and orchestra, pianoforte music, a suite, symphony, two quartets for strings, several songs, and the operas *Der Rubin* (1893); *Ghismonda* (1895); *Gernot* (1897); *Die Abreise* (1898); *Kain* (1900); *Der Improvisator* (1900); *Im Tiefland* (1903); *Das Flötensolo* (1906); *Tragaldabas* (1907); *Izeyl* (1909); *Liebesketten* (1913). Of these operas *Im Tiefland* was given at the Metropolitan Opera House in New York (1908). His later compositions show distinct individuality. He has also made excellent transcriptions for piano of some of Bach's organ works. About the year 1907 complaints began to be heard that his technic had deteriorated. In spite of increasing adverse criticism he continued to appear as a performer until 1909. After three years' retirement he reappeared in 1912 on the concert platform, showing that he had fully regained his former faultless technic.

ALBERT, ä'l'bërt; Ger. pron. ä'l'bërt, FRANCIS CHARLES AUGUSTUS EMANUEL (1819-61). Prince of Saxe-Coburg-Gotha, and the husband of Queen Victoria of Great Britain. He is popularly known as Prince Albert and the Prince Consort. He was born at Rosenau Castle, near Coburg, Aug. 26, 1819, the second son of Ernest, Duke of Saxe-Coburg-Gotha, and his wife Louise, daughter of Augustus, Duke of Saxe-Gotha-Altenburg. In the Prince's sixth year his parents separated, and he never afterward saw his mother, who died in 1831. The Prince and his elder brother, under a private tutor, received a careful education, and after a year of study at Brussels he attended the University of Bonn, where, in addition to the sciences connected with statecraft, he devoted himself with ardor to the study of natural history and chemistry and displayed great taste for the fine arts, especially painting and music. Several compositions of his obtained publicity, and an opera, afterward performed in London, is said to have been composed by him. He was gifted with a handsome figure and obtained expertness in all manly exercises. He married the young Queen of Great Britain on Feb. 10, 1840. On his marriage Prince Albert received the title of Royal Highness, was naturalized as a subject of Great Britain, and obtained the rank of field-marshal, the knighthood of the Order of the Bath, and the command of a regiment of hussars. As the union proved in the highest degree a happy one, the Prince was loaded with honors and distinctions both by the Queen and the nation. The title of Consort of Her Most Gracious Majesty was formally conferred in 1842, and that of Prince Consort, in 1857, made him a prince of the United Kingdom. He was also made a member of the Privy Council, governor and constable of Windsor Castle, colonel of the Grenadier Guards, acting Grand Master of the Order of the Bath, Chancellor of the University of Cambridge, the standard of which he succeeded in raising considerably, and Master of the Trinity House. Notwithstanding his high and favored position as the Queen's trusted counselor, the Prince, with rare prudence and tact, abstained from meddling with State affairs, and thus escaped the jealousy and detraction of parties, gradually attaining, indeed, the widest popularity. When the Whig

ministry in 1840 proposed for him the income of £50,000, as consort of Queen Victoria, the Tories in conjunction with the Radicals, succeeded in limiting the sum to £30,000. This incident, which occurred before the marriage, appears to have been the only instance of any manifestation of party feeling with reference to the Prince. On the other hand, he opened for himself an influential sphere of action, in the encouragement and promotion of science and art, appearing as the patron of many useful associations and public undertakings. The Exhibition of 1851 owed its origin and the greater part of its success to the Prince. An incessant worker in the interests of his adopted country, his toil undermined his constitution, and he succumbed to an attack of typhoid fever, Dec. 14, 1861. His memory is perpetuated under the surname "Albert the Good." The last of his political acts, one of particular interest to the United States, was instrumental in preventing a war which threatened to arise out of the seizure of the Confederate envoys on the English steamer *Trent*. The draft of the ministerial ultimatum submitted to the Queen seemed to the Prince needlessly irritating. Weak then from the beginning of his last illness, he arose at seven the next morning (Dec. 1, 1861), and wrote and presented a memorandum of his objections to the Queen. His suggestions, adopted by Lord Russell, proved acceptable to President Lincoln. Consult: Martin, *Life* (London, 1875-80); Vitzhum, *Reminiscences* (Eng. trans., 1887); Grey, *The Early Years of His Royal Highness the Prince Consort* (New York, 1867); Bräuer, *Prinz Albert von England und Die Deutsche Einheitsfrage* (Leipzig, 1910); *Principal Speeches and Addresses of Prince Albert* (London, 1862); Wintle, *The Story of Albert the Good* (London, 1897); Stockmar, *Denkwürdigkeiten aus den Papieren des Freiherrn Christian Friedrich von Stockmar* (Brunswick, 1872), translated by G. A. M. under the title *Memoirs of Baron Stockmar* (London, 1873), and Jerrold, *The Married Life of Queen Victoria* (New York, 1913).

ALBERT, FREDERICK AUGUSTUS (1828-1902). King of Saxony, 1873-1902. He served in the first Schleswig-Holstein War, and after his father's accession in 1854 presided over the Council of State. In 1866 he commanded the Saxon army, coöperating with Austria against Prussia. On the entrance of Saxony into the North German Confederation, this force became the twelfth corps of the North German army, and with them the Prince won high honors at Gravelotte and Sedan, receiving the Prussian Iron Cross and the command of the newly formed fourth army, at the head of which he entered Paris with the Emperor and the German princess. He succeeded his father on the throne in 1873. He died June 19, 1902, and was succeeded by his brother Georg. Consult Dittrich, *König Albert und Prinz Georg von Sachsen* (Minden, 1896), and Harden, *Monarchs and Men* (New York, 1913).

ALBERT, FREDERICK RUDOLPH (1817-95), generally spoken of by English writers as the Archduke ALBERT. Archduke of Austria, son of Archduke Charles, grandson of Leopold II, and first cousin of the father of the reigning Emperor. He was distinguished in youth as a cavalry commander, doing good service in the battle of Novara in 1849. He was Governor of Hungary, 1851-60; in 1866 he commanded the Austrians in Venetia, and won the victory of

Custoza, June 24; but Benedek's defeat at Sadowa, July 3, made his success nugatory. He became field-marshal in 1863 and inspector-general of the Austrian army in 1866. Albert married, May 1, 1844, Archduchess Hildegarde, daughter of Ludwig I of Bavaria. She died April 2, 1864.

ALBERT, HEINRICH (1604-51). A celebrated German composer, sometimes erroneously called Alberti, who was instrumental in developing the present form of the German *Lied*. He was born at Lobenstein, Saxony, and in 1622 went to Dresden to study music under his cousin, the Kapellmeister Heinrich Schütz (q.v.). He established himself at Königsberg in 1626, but soon afterward was taken prisoner by the Swedes. After two years of captivity he returned to Königsberg, when he again turned to music. In 1630 he received an appointment as organist at the cathedral, and at the same time began a thorough course in music under Stobäus. In conformity with the wishes of his parents, however, he discontinued his musical studies and entered the University of Leipzig to study law. Albert was not only a fine musician, but a poet of distinction as well, and the verses which he set to music were usually of his own composition. Several of these, however, were written by the poet Simon Dach, an intimate friend of Albert, and one whose influence is still evident in the well-defined poetic rhythm of the song-forms created by the latter. Albert published eight books of arias (1638-50) and the *Kürbishütte* (1645), a collection of chorals, arias, and *Lieder* for one or several voices. Many of his hymn-tunes, such as the well-known *Gott des Himmels und der Erden*; *Ich bin ja, Herr, in Deiner Macht*; and *Unser Heil is Kommen*, are still extensively used in the Protestant service. A selection of his songs, with the music, has been published in the work entitled *Neudrucke Deutscher Litteraturwerke* (Halle, 1883).

ALBERT, JOSEPH (1825-86). A German photographer, who was born and died at Munich. He established a photographer's studio at Augsburg in 1850, and removed to Munich in 1858. About 1867 he introduced an improvement of the greatest importance in photo-mechanical printing (*Lichtdruck*). It had been known since about 1854 that a film of gelatin containing potassium-bichromate does not receive greasy inks unless it has been previously subjected to the action of light and damping. This fact had been utilized for printing purposes by coating a metal plate with gelatin containing some bichromate of potash and chloride of mercury, treating with silver oleate, and exposing to the action of light through a negative. On washing and inking with a lithographic roller, the plate could be used for printing. The soft gelatin coating, however, was extremely perishable, and therefore the process was capable of only limited application until Albert introduced his improvement. Albert found that the gelatin could be sufficiently hardened and rendered durable simply by the action of light. In place of the old metallic plates, he therefore substituted transparent plates, the uncoated side of which he exposed to the action of light. In this manner it became possible to obtain more than a thousand "Albertype" copies from one plate, and the process was adopted in general use. See GELATIN PROCESS.

ALBERT I, called THE BEAR (c.1100-70). Margrave of Brandenburg. He was the son and

successor of Otto the Rich, Count of Ballenstädt, and of Eilika, daughter of Magnus Billung, Duke of Saxony. Having aided the Duke of Saxony, who became the Emperor Lothair, he received from the latter Lusatia, to be held as a fief of the Empire, and later the northern "mark." In the year 1137 Henry, Duke of Saxony, having been put under the imperial ban, the duchy was given to Albert, when he took the title of Duke of Saxony. Henry, however, was victorious in the contest which followed, and Albert was compelled to flee, and retained only the margraviate of northern Saxony. Returning to his own country, he had himself invested with the lands which he had conquered from the Wends, as a hereditary fief of the Empire, and thus became the founder and first margrave of the new State of Brandenburg. Consult Heinemann, *Albrecht der Bär* (Darmstadt, 1864).

ALBERT I (1317-79). Duke of Mecklenburg, founder of the present reigning dynasty. He was a son of Prince Henry II, the Lion, and reigned as prince from 1329 until 1348, when he was appointed Duke by the Emperor Charles IV. Relying upon the cities of his realm, he sought to suppress the frequent feuds of the nobles and to find advantages by active participation in the affairs of the Empire. Upon the extinction of the dynasty of Schwerin, he united the domains of that principality with his own (1358). He was also instrumental in securing the crown of Sweden for his son, afterward known as Albert II. See **ALBERT, DUKE OF MECKLENBURG**, and **KING OF SWEDEN**.

ALBERT I (1875—). King of the Belgians. He was born April 8, 1875, the only son of Philip, Count of Flanders, younger brother of Leopold II of Belgium (q.v.). He was carefully educated and in 1900 married Duchess Elizabeth, daughter of Karl Theodor, Duke of Bavaria, and Marie Joseph, daughter of Prince Miguel of Braganza. Before his accession to the throne he bore the title Count of Flanders. His democratic and friendly manner had made him the most popular member of the reigning house. He traveled widely and was a student of politics and economics. In 1898 he visited the United States and made a study of American railroads under the guidance of James J. Hill. Several years later, he made an extended tour of the Belgian Congo and upon his return to Belgium strongly urged upon his uncle the need of railroad development and of reform in the treatment of the natives. When he became King, many improvements in the administration of this colony were carried out. (See **BELGIUM** and **CONGO, BELGIAN**.) On the death of Leopold II Albert became King, on Dec. 23, 1909. Three children were born of his marriage—Prince Leopold, heir-apparent, born Nov. 1, 1901; Prince Charles, born Oct. 10, 1903, and Princess Marie-José, born Aug. 4, 1906.

ALBERT II, DUKE OF MECKLENBURG. See **ALBERT, KING OF SWEDEN**.

ALBERT IV, called **THE WISE** (1447-1508). Duke of Bavaria, third son of Albert III, surnamed "the Pious." After the death of his father, in 1460, he was placed under the guardianship of his elder brothers, John III and Sigismund, who had conjointly succeeded to the regency; and upon the death of John (1463), he became co-regent with Sigismund. The acquisition of the territories of the house of Bavaria-Landshut greatly increased the extent of his possessions. In consequence of this in-

crease of power, however, he became involved in a feud with several members of the nobility, and his interference in the affairs of Regensburg (Ratisbon) finally aroused the displeasure of the Emperor and he was placed under the ban. His principal achievement was the establishment of the law of succession in the dukedom of Bavaria (July 8, 1506).

ALBERT V (1528-79). Duke of Bavaria, a son of Duke William IV and Maria Jakobäa of Baden. He succeeded to power in 1550 and soon became involved in religious and other disputes, in consequence of which the power of the feudal barons in his dominions was completely broken. He banished the Protestants from his dominions and prohibited the publication of books favorable to them. He greatly encouraged engraving, painting, brass-founding, and the industrial arts, and laid the foundation of a museum of art as well as of a museum of antiquities, a gallery of paintings, and a royal library. Upon his death he left debts to the amount of 2,500,000 florins.

ALBERTA, ä'l-bûr'tä, a province of Canada established on Sept. 1, 1905, with Saskatchewan (q.v.), by the Dominion Parliament. It was formed out of the former district of Alberta, and parts of the former districts of Athabasca, Saskatchewan, and Assiniboia, and its boundaries are described as the line of the 60th degree of north latitude on the north, the 120th meridian west of Greenwich and the main divide of the Rocky Mountains on the west, the 49th parallel on the south, and the 110th meridian west of Greenwich on the east. The area is given officially as 253,540 square miles. Of this 187,500 square miles are rated as good arable land; 35,400 square miles have been homesteaded or given away in special grants to those who agree to settle on the land or perform settlement duties; 20,500 square miles have been granted to railway companies as subsidies for the construction of their lines; and 4120 square miles have been granted to the Hudson's Bay Company. Most of this is classified as agricultural land. Of the total area of the province, about 91,000 square miles have been surveyed. In 1901 the population of the province was 72,841. By 1906 this figure had increased to 185,412, the advance being due to immigration, which has been very rapid. Following is a table showing the arrival of immigrants since 1906:

1906.....	17,559
1907.....	31,477
1908.....	27,651
1909.....	42,509
1910.....	44,782
1911.....	45,957
1912.....	48,073
Total	258,008

The population figure for the census of 1911 was 374,663. The northern half of the province and the eastern part of the southern half are, generally speaking, level; but the western part below lat. 56° N., and the southwestern, as it nears the foothills of the Rocky Mountains, become broken and hilly. Most of the eastern half and part of the western are prairie land. Central Alberta is well timbered and well watered. The western part of Lake Athabasca is within the limits of the province, and there are numerous smaller lakes. The river systems are of great

ALBERTA

SCALE OF MILES
0 10 20 30 40 50

Railways thus



importance in determining the fertility of the soil by the intersecting valleys which they create. The Athabasca and Peace rivers, joined by numerous tributaries, flow northerly and northeasterly respectively into Lake Athabasca, and thence into the Mackenzie River system and the Arctic Ocean; the Saskatchewan, north and south branches, and tributaries traverse the western part of the province and join the system that drains into Hudson Bay; in southern Alberta some of the tributaries of the Missouri River take their rise and thence drain into the Mississippi and the Gulf of Mexico.

The soil of Alberta is exceptionally rich in the great central region, consisting chiefly of from one to three feet of black vegetable mould, with but small mixture of sand and gravel. The eastern part, except in the south, is not so fertile; and in the south the comparative lack of moisture is being supplied by irrigation. This portion, which was formerly given up to ranching, has recently been devoted in many places to mixed farming and promises a considerable increase in that respect. Irrigation works receive government supervision and aid, and have also been undertaken by many farmers on their own lands, and by corporations, including the railway companies. In 1906 one of the latter was engaged in an irrigation scheme which embraced 3,000,000 acres between Bow and Red Deer rivers. The climate of the province is healthful and invigorating, extremes of heat and cold being mitigated by the dryness of the air; but, as the province extends through 11 degrees of latitude, the temperature varies considerably. Calgary, in lat. 51°, has a moderate and changeable climate, with a mean winter temperature of 15.4°; Edmonton, 53½°, enjoys a steadier climate, but the mean winter temperature drops to 10.3°; Fort Chippewyan, 59°, has a severe climate, with mean winter temperature of 7.2°. The average annual temperature at Edmonton is about the same as that of St. Paul, Minn. The Chinook winds that blow from the west across the Rocky Mountains melt the snow, so that in the southern part of the province cattle and horses can live in the open air throughout the winter. The possibilities in cereal crop raising in Alberta were recognized at the beginning of the twentieth century, and during the first decade the cultivation of cereals developed enormously. Wheat, oats, and barley are most successfully cultivated, especially in central Alberta. Wheat often produces 40, barley 60, and oats 70 to 85 bushels per acre, the latter sometimes producing 100 weighed bushels per acre. Following is a statement showing increase in grain production in Alberta for the decade 1901-11:

Grain	1901		1911	
	Acres	Bushels	Acres	Bushels
Spring wheat . . .	42,668	780,613	757,493	15,730,238
Fall wheat	518	14,682	182,671	4,336,749
Barley	10,987	285,381	103,302	3,037,584
Oats	117,224	3,770,701	669,825	27,604,993
Rye	1,018	17,249	2,190	38,722

Root crops are also successful, and in southern Alberta the sugar beet, which is of exceptional quality, promises large additions to this industry. Apples are grown; so is tobacco in certain parts, and among the native small fruits are raspberries, strawberries, gooseberries, cran-

berries, cherries, and black currants. In the lakes fish are plentiful, and an abundance of small game, such as mallard, teal, wild goose, partridge, and prairie chicken, is found. Twelve government creameries and a large number of others attest the growth of dairying, and the industry is organized with special reference to cold storage and rapid shipment. In 1911 the value of the field crops was \$47,675,000, of which amount the fall wheat was valued at \$5,993,000; spring wheat, \$16,260,000; oats, \$15,893,000; and barley, \$1,694,000. In 1912 there were 351,500 horses, 1,091,600 cattle, 181,000 sheep, and 175,200 swine.

Manufacturing interests are important and growing rapidly. In 1910 there were 290 manufacturing establishments, an invested capital of \$29,518,346, employing 6980 persons, and a product valued at \$18,788,826. In 1905 there were 120 establishments, an invested capital of \$5,545,821, employing 2045 persons, and a product valued at \$5,116,782.

The mineral deposits of Alberta are especially rich. There are large areas underlaid with bituminous coal, semi-bituminous, and lignite, the aggregate coal area being placed at 16,588 square miles. There is an extensive and valuable anthracite deposit in the neighborhood of Banff, on the Canadian Pacific Railway. Gold has been found in the vicinity of Edmonton, and along the banks of the Athabasca, Saskatchewan, Pembina, Macleod, and other rivers. Galena, with a large percentage of silver, has also been found, and natural gas occurs in several places. In 1910 there were mined 878,011 tons of lignite, 1,896,961 tons of bituminous coal, and 261,785 tons of anthracite. In 1912 the lignite output had increased to 964,700 tons; but owing to labor troubles the output of bituminous and anthracite had decreased to 649,745 and 80,119 tons respectively. The total value of the mineral production in 1912 was \$12,110,960.

The bank clearings for Edmonton, Calgary, Medicine Hat, and Lethbridge in 1912 amounted to \$643,836,229 as compared with \$408,811,748 in 1911.

The railway development of the province since 1900 has been remarkable. The main line of the Canadian Pacific was completed to Vancouver in 1885, and in 1905 this was the only railway in the province. At that time it had a mileage of 1060, and the principal branch lines stretched from Calgary to Edmonton and from Calgary to Macleod. In 1912 the province had four lines—the Canadian Pacific, the Canadian Northern, the Grand Trunk, and the Edmonton Duvegan and British Columbia railways, with mileages of 1480, 1912, 638, and 25, respectively, and a grand total of 3055 miles. The cities of the province, with population according to the 1911 census, are: Calgary, 43,704; Edmonton, 24,900; Lethbridge, 8050; Medicine Hat, 5608; Strathcona, 5579; Wetaskewin, 2411. These cities and many towns are growing rapidly. There are still millions of acres of free land. The government forest reserve on the Rocky Mountain slope includes over 18,000 square miles. In 1905 the immigration into Manitoba, Saskatchewan, and Alberta amounted to 146,266, of which the last-named province received about one-third. Of these immigrants 65,359 were British, 43,652 from the United States, and 37,255 from Continental Europe. In the fiscal year ended March 31, 1912, the immigration into Manitoba, Saskatchewan, and Alberta

amounted to 135,592, of which the last-named province received 45,957.

In 1912 the government telephone system had 4000 miles of long distance line, connected with 270 points; 4800 miles of rural line with 5000 subscribers; and a total investment of \$3,800,000. Early in the same year, according to the statement of Premier Sifton, the programme of new construction included over 3000 miles of rural lines and over 700 miles addition to existing long distance lines. In 1912 in 82 towns there were 118 newspapers, of which 10 were daily and 99 weekly.

The government of Alberta is organized on the same principle as the other provinces of the Dominion. The capital is Edmonton. The province is represented in the Dominion Senate by four members, a number which may be increased. To the House of Commons it sends seven representatives, but this number will be increased to 12 on the basis of the 1911 census. The legislative power is vested in an assembly of 41 members with the lieutenant-governor, who is aided in the performance of his executive duties by an appointive council. The province derives its revenue from three sources: (1) from a Dominion subsidy, which in 1912 was \$1,216,895; (2) from public school lands, which in 1912 amounted to \$166,056; and (3) from a tax on corporations, such as insurance, railway, land, loan, and trust companies, banks, etc. From these three sources there is an annual revenue of about \$3,000,000. The grants made by the Dominion government towards the provincial treasury are the following: for the support of the government and legislature, \$50,000; an allowance of 80 cents per head on an estimated population of 250,000 and up to 800,000, yielding at present \$200,000; compensation for the share of the public debt falling on the province, which has no debt of its own, 5 per cent on the sum of \$8,107,500 or \$405,375; compensation for the retention by the Dominion government of public lands within the province, 1 per cent on an estimated valuation of \$37,500,000 until the population shall exceed 400,000, 1½ per cent until a population of 800,000 is reached, 2 per cent when 1,200,000 has been reached, and 3 per cent thereafter; for the construction of the necessary public buildings one-fourth of 1 per cent on the valuation of the public lands is granted for a period of five years. The lands granted to railways within Alberta aggregate 13,120,000 acres, and an equal area, approximately, is distributed in the form of Indian reservations, parks, school lands, and the possessions of the Hudson's Bay Company. In 1912 there were 2029 school districts in the province, about 70,000 pupils, and grants paid amounted to \$430,932.72. There is nominal provision for separate public schools for Protestants and Roman Catholics, but in most districts it is not put into effect. The higher educational institutions include the University of Alberta at Edmonton, with the affiliated Alberta College (Methodist) and Robertson College (Presbyterian); the University of Calgary; a provincial normal school; Lutheran College at Camrose; Mount Royal College (Methodist), and Western Canada College (Baptist) at Calgary; and the Presbyterian Ladies' College at Red Deer.

The formal inauguration of provincial government took place at Edmonton on Sept. 1, 1905, in the presence of Earl Grey, the Governor-General of Canada, and Sir Wilfrid Laurier, the Do-

minion premier. George Hedley Vicars Bulyea was installed as first lieutenant-governor, and Alexander Cameron Rutherford, a leading Liberal politician, was entrusted with the task of organizing the first government of the new province. The first Legislature assembled at Edmonton early in 1906. During its sessions, which lasted until 1910, a number of important measures were passed. A public school system was organized, a judicial system established, government-owned and operated telephones introduced, restrictions imposed on the liquor traffic, and for the protection and compensation of miners and other workmen. Liberal government aid was extended to agriculture and the development of the dairying industry. In July, 1909, the Grand Trunk Pacific Railway connected Edmonton with Winnipeg, and in the same year the government bought the Bell Telephone Company's rights and made public ownership of the telephone system complete. In October Earl Grey laid the cornerstone of the new parliament building at Edmonton. The second Legislature, which assembled in February, 1910, was formally opened by Lieutenant-Governor Bulyea, who in the same year was appointed for a second term. A political crisis, involving the resignation of Premier Rutherford and the accession to his office of Hon. Arthur Lewis Sifton, Chief Justice of the Province, was precipitated by the proposed building of the Alberta and Great Waterways Railway, to connect Edmonton with the vast northern grain-growing fields of the province. The terms of the contract, and certain proceedings which had taken place in pursuance thereof, were criticized as insufficiently protecting the popular rights. Premier Sifton undertook to procure the application of over \$7,000,000, which had been deposited in various banks under proceedings growing out of the contract, for purposes of revenue. The promoters of the railway opposed this, and the resulting litigation culminated in an appeal to the Judicial Committee of the Privy Council, which in 1912 had not given a decision. During 1911-13 two proposed changes of public policy commanded wide attention. The government opposed the Canadian Pacific Railway's exemption from taxation. The amount involved was over \$60,000,000, but the Judicial Committee of the Privy Council upheld the legality of the exemption. It was also proposed that the province should acquire control of all lands not available for free settlement, and which at present are part of the public domain and vested in the crown. The objects were increased efficiency in developing the provincial resources and the expansion of the provincial revenues. The question was regarded as likely to persist until settled in favor of the Province. The rapid progress of Alberta compelled the enlargement of the Cabinet, so that in 1912 it had increased from four to eight administrative departments. Consult Leo Thwaite, *Alberta: An Account of its Wealth and Progress* (London, 1912).

ALBERT CHAPEL. A memorial chapel in Windsor Castle. See WINDSOR CASTLE.

ALBERT EDWARD. See EDWARD VII.

ALBERT EDWARD NYANZA. See LAKE EDWARD.

ALBERT EMBANKMENT. The name given to a part of the Thames Embankment (q.v.), London.

ALBERT HALL, THE ROYAL. An amphitheatre in Kensington, London, built in 1867-71

for concerts and other large assemblies. In shape the building is oval, 270 by 240 feet in dimensions; it seats 8000 people. Its style is Italian Renaissance, the material being brick and the chief external ornament a frieze in terra cotta, representing the different races of men. Its organ, which has nearly 9000 pipes, is famous as one of the largest in the world.

ALBERTI, ăl-bâr'tê, DOMENICO (c.1707-40). An Italian composer. He was born in Venice and died in Formio. A style of broken chord bass-accompaniment, which he developed, still is called "Alberti" or "Albertinian" bass.

ALBERTI, LEON BATTISTA DEGLI (1404-72). An Italian architect and writer, the leader in the second phase of early Italian Renaissance architecture, and its greatest theorist on the fine arts. He was born in Venice, Feb. 18, 1404, the illegitimate son of Lorenzo degli Alberti, of a noble and powerful Florentine family, at that time in exile. He received the best education which the age could afford, at first in the school of Barsizia at Padua, then at the University of Bologna, from which he was graduated, at the age of 24, with the degree of Doctor of Laws. At 20 he wrote a Latin comedy which deceived the elect, and he thoroughly mastered Greek, besides being proficient in mathematics and the natural sciences. He was, moreover, a poet and a philosopher, and as a musician ranked as one of the first organists of his day. He excelled also in physical and social accomplishments, and, like Leonardo da Vinci, exercised a powerful and fascinating influence upon all contemporaries. In 1428 he returned from exile to Florence, and afterward traveled through France, the Low Countries, and Germany in the following of the Cardinal Albergati. In 1432 he was appointed a papal secretary by Eugenius IV. His architectural training began with the study of antique monuments during his first stay in Rome, 1432-34. Returning with the Pope to Florence, he entered with ardor into the artistic life of the city. Brunelleschi and Donatello (q.v.) were his friends and associates, and it was probably at this time that he discovered the mathematical laws of linear perspective, which were of incalculable value to the painters of his own and the succeeding generation. He took an active part in the literary life of Florence, and figured as a champion of the use of the native tongue instead of Latin. After spending nine years with the papal court in Florence and elsewhere, he returned with it to Rome, where most of the remainder of his life was spent. He was secretary to six popes, and stood in high favor with Eugenius IV, Nicholas V, and especially with the humanist Pius II. His advice in matters of architecture was, no doubt, sought by the supreme pontiffs, and at least under Nicholas V he was in charge of the projects for rebuilding St. Peter's and the Vatican.

Although Alberti's buildings rank among the best of the Renaissance, he was a theorist rather than a practical architect. He furnished only the plans of his buildings, never supervising their construction. His art is the most strictly classical of the Early Renaissance and prepared the way for that of Bramante (q.v.) and the High Renaissance. Its purity is shown in the façade of the church of San Francesco at Rimini, adapted from the arch of Augustus at Rimini. His intended use here of the dome, his barrel vaults at Sant' Andrea in Mantua, show how in construction he also returned to the forms

of ancient Roman architecture. He had a number of pupils and associates, who carried out his plans: Matteo dei Pasti, at Rimini; Fancelli, at Mantua; Bertini in the façade of Santa Maria Novella at Florence (where he so successfully copied the mediæval style of incrustated marbles); and Rossellino in the famous Rucellai Palace (1446-51) at Florence, which combined the older rustic with the smooth pilastered style. His book *De Re Ædificatoria* (1485) was the first great printed work on architecture of the Renaissance, and had been preceded by a manual on the five orders, as well as by other manuals on statuary and painting. The best of these is *De Pictura libri iii*, written in Italian, and the most important treatise on painting before Leonardo. It was first published at Basel in 1540, and the best modern edition is that of Janitscheck (1877). Consult his biography by Mancini (Florence, 1882), for detailed and reliable information; also the scholarly treatise of Von Geymüller, in *Die Architektur der Renaissance in Toscana* (Munich, 1888). The latest biography is by Londi (Florence, 1906), and there is an excellent and detailed article by Suida, in Thieme and Becker's *Allgemeines Künstler Lexicon*, vol. i (Leipzig, 1907).

ALBERTINELLI, ăl-bâr'tê-něl'lê, MARIOTTO (1474-1515). A Florentine painter of the High Renaissance. He was born of an ancient and noble Florentine family and studied with Cosimo Roselli, and, according to Berenson, with Piero di Cosimo. In Roselli's workshop he formed his life-long friendship with Fra Bartolommeo (q.v.). Jovial and worldly, he was the direct opposite of his clerical friend, with whom he established a common studio. When Bartolommeo entered the cloister in 1500, Mariotto worked independently until his friend's return to Florence in 1509, when he joined him in the atelier of the cloister of San Marco. Their joint signature was a cross with two locked rings until their final separation in 1512. According to Vasari, Albertinelli, in despair, became an innkeeper; what really happened was that he inherited his father-in-law's wine shop. A public house bearing his name still exists in Florence. He soon resumed painting and was afterwards active at Santa Maria della Quercia and in Rome, where he fell ill. He died Nov. 5, 1515, soon after his return to Florence. Although his pictures show his intimate relation with Fra Bartolommeo, who was the stronger artist of the two, Albertinelli's best work belongs to the finest produced by the Renaissance. Among their joint productions are an "Annunciation" (1497) in the Volterra, the "Last Judgment" (1498), a fresco of Santa Maria Novella, now in the Uffizi; and the fine "Madonna in Glory" in the cathedral of Besançon. Of his independent pictures the finest is the "Visitation" (1503) in the Uffizi, a work of great beauty; others are a "Holy Family" in the Pitti Gallery, a smaller "Madonna," a "Trinity" and an "Annunciation" (1510), in the Florence Academy; a small triptych in the Poldo-Pezzoli Museum, Milan; and the painting of a female saint, in the possession of Mrs. Samuel Untermyer, New York. Consult Gruyer, *Fra Bartolommeo della Porta et Mariotto Albertinelli* (Paris, 1886), and the works cited under Fra Bartolommeo (q.v.), which treat also his friend.

ALBERTIS, ăl-bâr'tês, LUIGI MARIA D' (1841-1901). An Italian traveler, born at Voltri. He attended the College of Savona and served in the

army of Garibaldi in 1860. From 1871 to 1878 he made a careful exploration and study of the island of New Guinea. The results of this expedition he published in his *Esplorazione della Nuova Guinea* (1880; Eng. trans., 1880).

ALBERTITE. An asphaltic hydrocarbon compound obtained at Hillsborough, Albert Co., New Brunswick, Canada, where it occurred in a fissure vein in rocks of the Upper Devonian age. It is a soft, jet black mineral that has been derived from petroleum by oxidization of the oily contents, and it was at one time highly prized as a gas-enricher. See ASPHALTIC COAL.

ALBERT LAKE. See LAKE ALBERT.

ALBERT LEA. A city and the county-seat of Freeborn Co., Minn., 100 miles (direct) south of Minneapolis on the Chicago, Milwaukee, and St. Paul, the Minneapolis and St. Louis, the Chicago, Rock Island, and Pacific, the Iowa Central, and the Illinois Central railroads (Map: Minnesota, D 7). Two fine lakes, county fair grounds, well-kept parks and boulevards, and large hotels make Albert Lea a popular summer resort. The city also contains a splendid county court house, an opera house, public baths, etc., and is the seat of the Albert Lea College for women (Presbyterian), opened in 1885, and the Luther Academy. It is the market for the agricultural and dairy products (chiefly butter) of the surrounding region. It has the only creamery owned and operated by the State in the world. It has also gas engine, corset, paper box, mill tool, road grader, and culvert and tank factories, two creameries, a pork-packing house, etc. There are some 50 artesian wells of chalybeate water, which are owned and operated by the city. Pop., 1890, 3305; 1900, 4500; 1910, 6192; 1913 (est.), 11,283.

ALBERT MED'AL. A decoration instituted in England (1866)—in memory of Prince Consort Albert, whose name it bears—to reward heroic acts in saving life at sea. In 1877 it was extended to acts of gallantry in preventing loss of life in perils on land. There are two classes, the first of gold and the second of bronze, with the words "For Gallantry in Saving Life at Sea" or "on Land," as the case may be.

ALBERT MEMORIAL. A monument of Prince Albert, the Consort of Queen Victoria of England, who died in 1861. The monument, by Sir Gilbert Scott, is in the Victorian Gothic style, in an adaptation of Italian Gothic suggestions, with inlays, mosaic, and a frieze of allegorical sculpture, the whole forming a vaulted canopy over the statue of the Prince. It is situated in Kensington Gardens. See LONDON.

ALBERT NYANZA. See LAKE ALBERT.

ALBERT OF AIX, or AACHEA (fl. c.1125). A French historian, of whose life very little is known beyond the fact that he was a canon and "custos" at Aix-la-Chapelle. He was the author of a work which included the history of the first crusade and of the Latin Kingdom of Jerusalem to 1121. Formerly this was widely used by all historians of the crusades from William of Tyre (q.v.) down to 1840. Then its value was attacked by H. von Sybel (q.v.), and for about 40 years it was regarded as almost worthless. Now its value is again recognized, and the theory is current that Albert's work is based upon a chronicle written by a follower of Godfrey of Bouillon (q.v.). Along with much fabulous material it contains much that is valuable. There is no good edition; the least unsatisfactory is in the *Recueil des Historiens des croisades: histori-*

ens occidentaux. See Sybel, *Geschichte des ersten Kreuzzuges* (2d ed., Leipzig, 1881); Kugler, *Albert von Aachen* (Stuttgart, 1885); Ver-crugsse, *Essai critique sur la chronique d'Albert d'Aix* (Liège, 1889).

ALBERTSON, CHARLES CARROLL (1865—). An American clergyman and writer, born at Plainfield, Ind. Educated at first to be a lawyer, he later turned to the ministry, for which he received his training at the Garrett Biblical Institute of Northwestern University. He filled pastorates at Goshen, Ind. (1888-92); Jamestown, N. Y. (1892-95); Buffalo, N. Y. (1895-99); and Philadelphia (1899-1904). In 1904 he became pastor of the Central Presbyterian Church of Rochester, N. Y., where he remained until called to the pulpit of the Lafayette Avenue Presbyterian Church, Brooklyn, in 1913. The degree of D.D. was conferred upon him by Allegheny College in 1899. Becoming known as a lecturer and as preacher to various colleges, Dr. Albertson was made a member of the American Philosophical Society and of the Victoria Institute of London. Besides editing several religious compilations and contributing articles to periodicals, he published the following: *Safe Counsel and Sweet Comfort* (1891); *The Gospel according to Christ* (1898); *Many Voices* (1904); *Death and Afterwards* (1907); *College Sermons* (1910); *Distinctive Ideas of Jesus* (1911).

ALBERTUS MAG'NUS. See ALBERT, COUNT OF BOLLSTÄDT.

ALBERTYPE. See PHOTOGRAPHY; ALBERT, JOSEPH.

ALBES'ENCE. This term is applied to the whitening of portions of foliage leaves different from the blanching due to the absence of light (*etiolation*, q.v.) or the absence of green caused by the lack of iron (*chlorosis*, q.v.). The variegated leaves of many greenhouse plants, such as fancy caladiums, silver geraniums, and striped ribbon grass, afford good examples of albescence. Such leaves must be regarded as less efficient foliage organs than those entirely green. In the case of abutilon (q.v.), the whitening is thought to be due to the presence of a virus, at least the albescence may be transmitted through inoculation by grafting, but in other instances the cause of the albescence is unknown.

ALBI, à'lbè, or ALBY. The capital of the department of Tarn in France, built on an eminence (570 feet high) overlooking the river Tarn, which is here crossed by a beautiful stone bridge (Map: France, S., G 5). Albi suffered greatly during the religious wars which devastated the land in the time of the Albigenses, who took their name from this town. The chief building is the cathedral of St. Cecilia, built of brick in a unique style and decorated on wall and ceiling with frescoes executed by the first Italian painters of the day. The south portal is a remarkable example of decorated Gothic. It is adorned with an exquisite recumbent statue of the patron saint in marble. The town maintains a library (including many incunabula) and a museum. There are large brickyards at Albi, and it has a considerable trade in grain, wine, fruit, etc., and linen, cotton, wool, and leather manufactures. Pop., 1896, 14,983; 1901, 18,262; 1906, 23,303; 1911, 25,100.

AL'BIA. A city and the county-seat of Monroe Co., Iowa, 68 miles southeast of Des Moines, on the Chicago, Burlington, and Quincy, the Minneapolis and St. Louis, the Wabash, the Southern Iowa Traction Company, and other railroads

(Map: Iowa, E 3). With its excellent transportation facilities, the city controls a large trade in coal, which is extensively mined in the county, and in agricultural products, live stock, and grain. There are also metal works, a telephone factory, and a packing house. Pop., 1890, 2359; 1900, 2889; 1910, 4969; 1913 (est.), 5342.

AL'BIGEN'SES. A name applied to the heretical Cathari in the south of France about the beginning of the thirteenth century. The name arose from the circumstances that the Cathari were especially numerous in the district of Albigeois, about Albi, in Languedoc. It seems to have been first used in 1181. The so-called Albigenian Crusade was undertaken by Pope Innocent III in 1209. The immediate occasion of it was the murder of the papal legate and inquisitor, Peter of Castelnau, who had been commissioned to extirpate heresy in the dominions of Count Raymond VI of Toulouse; but its real purpose was to deprive the Count of his lands, as he had become an object of dislike from his toleration of the heretics. It was in vain that he had submitted to the most humiliating penance and flagellation from the hands of the legate Milo and had solicited papal absolution by great sacrifices. The legates Arnold, Abbot of Citeaux, and Milo, who directed the expedition, took by storm Béziers, the capital of Raymond's nephew, Roger, and massacred 20,000 of the inhabitants, Catholics as well as heretics. Simon de Montfort, who conducted the war under the legates, proceeded in the same relentless way with other places in the territories of Raymond and his allies. Of these, Roger of Béziers died in prison, and Peter I of Aragon fell in battle. A part of the conquered lands were given as a reward to Simon de Montfort, who was killed at the siege of Toulouse, 1218. Counts Raymond VI and VII disputed the possession of their territories with his son. But the papal indulgences drew fresh crusaders from every province of France to continue the war. Raymond VII continued to struggle bravely against the legates and Louis VIII of France, to whom Montfort had ceded his pretensions. After many thousands had perished on both sides, a peace was concluded, in 1229, when Raymond purchased relief from the ban of the Church by immense sums of money, gave up Narbonne and several lordships to Louis IX, and had to make his son-in-law, the brother of Louis, heir to his other possessions. The Albigenes were left without a protector. The heretics were handed over to the proselytizing zeal of the order of Dominicans and the tribunals of the Inquisition, and both used their utmost power to bring the recusant Albigenes to repentance, and also, by inflicting severe punishment on the penitent converts, to inspire dread of incurring the Church's displeasure. From the middle of the thirteenth century the name of the Albigenes gradually disappears. The remnants of them took refuge in the East, some settling in Bosnia. Consult: Schmidt, *Histoire de la secte des Cathares ou Albigeois* (Paris, 1849); Lea, *History of the Inquisition* (New York, 1888); Döllinger, *Beiträge zur Sektengeschichte des Mittelalters* (Munich, 1890); Luchaire, *Innocent III et la croisade des Albigeois* (Paris, 1905). The last is easily the best discussion of the subject, but contains no references to sources.

ALBI'NO (Portug. and Sp., from Lat. *albus*, white). A term first applied by the Portuguese

to the white negroes of West Africa; now applied to any individual in whom there is congenital deficiency of pigment in skin, hair, iris, and choroid of the eye. The skin is abnormally pale, the hair is white or pale flaxen, and the iris is pink. An albino is termed *leucoëthiop* by the Latins, *kakerlak* by the Germans, *bedo* in Ceylon, and *dondo* in Africa. The absence of pigment in the iris renders an albino's eyes sensitive, and partially blind in the sunlight. Nystagmus (oscillation of the eyeball), photophobia, and astigmatism are often present. Albinism is found in many races as a rare condition. Cushing found it among the Zuñi. It is sometimes a family trait. It occurs frequently among rabbits, mice, birds, and other lower animals. See also SOMATOLOGY; VITILIGO; MELANISM AND ALBINISM.

AL'BINOVA'NUS, PEDO. A Roman epic writer; a friend and contemporary of Ovid, who addressed to him one of his *Epistolæ ex Ponto*. He is to be identified, perhaps, with the Pedo mentioned by Tacitus as *præfectus equitum* under Germanicus (q.v.) in Germany. In addition to his epic on the exploits of Germanicus in Germany, fragments of which are preserved in the *Suasoriæ* of Seneca, he is said to have written a poem entitled *Thesëis*, an epic on contemporary history, and numerous epigrams; but he was probably not the author of the elegy on the death of Drusus, which has been attributed to him. Albinovanus is quoted by the younger Seneca, who calls him *Fabulator Elegantissimus*, and is mentioned as a wit by Martial and Quintilian. Consult: Wernsdorf, *Poetæ Latini Minores*, vol. iv; Bährens, *Poetæ Latini Minores* vol. i (Leipzig, 1879; 2d ed., by Vollmer, Leipzig, 1910); Haupt, *Opuscula*, vol. i (1875); Haube, *Beitrag zur Kenntnis des Albinovanus Pedo* (1880).

ALBINUS, BERNHARDT SIEGFRIED (1697–1770). A German anatomist, born at Frankfort-on-Oder. He studied medicine under his father, Boerhave, and Rau. In 1718 he became professor of anatomy at the University of Leyden, and, in 1745, professor of medicine. He was known as one of the greatest instructors in anatomy of his day, and his works *De Ossibus Corporis Humani* (1726) and *Historia Musculorum Humini* (1734) are still of considerable value.

ALBI'NUS, CLODIUS, the popular name for DECIMUS CLODIUS CEIONIUS SEPTIMIUS ALBINUS (?–197 A.D.). A Roman commander. He was a governor of Gaul and Britain at the time of the death of the Emperor Commodus (192), and was made Cæsar by Septimius Severus in 194, as a means of keeping him neutral. After defeating his rivals, however, Severus turned his arms against Albinus, and in a battle near Lugdunum (Lyons) in Gaul (197), Albinus was defeated and killed (Dio Cass. lxx, 4, *Vita Albini*).

AL'BION (Lat. Gk. Ἄλβιον, *Alouïōn*, from Lat. *albus*, white, referring to the chalk cliffs of the southern coast). The most ancient name of the island of Great Britain. See under ALBANY, or ALBAINN.

ALBION. A city in Calhoun Co., Mich., 96 miles west of Detroit, on the Michigan Central, the Lake Shore and Michigan Southern railroads, and an electric line running from Kalamazoo to Detroit, and on the Kalamazoo River (Map: Michigan, E 6). The city owns its water supply, has a city library, two hospitals and park, and is the seat of Albion College, under Methodist

Episcopal control. Its principal manufactures are malleable iron, flour, carriage and automobile seat springs, locks, hinges, screens, and agricultural implements. Albion was first settled in 1830 and is governed under a charter adopted in 1896, revised in 1897 and in 1899, which provides for a mayor, elected annually, and a city council, composed of the mayor, city clerk, and eight aldermen. Pop., 1890, 3763; 1900, 4519; 1910, 5833; 1913 (est.), 7893.

ALBION. A village, the county-seat of Orleans Co., N. Y., 30 miles northwest of Rochester, on the New York Central Railroad, Buffalo, Lockport, and Rochester Railway, and on the Erie Canal (Map: New York, B 4). The Western House of Refuge for Women, the Swan Library, the high school, the court house, Pullman Memorial Church, and Mount Albion Cemetery are prominent features of interest. It has a very large canning factory and manufactures cement building blocks, etc. Much fruit is grown in the surrounding country. There are three large cold-storage plants in the village. Albion is governed, under a revised charter of 1890, by a mayor, elected triennially, and a board of trustees. Pop., 1890, 4586; 1900, 4477; 1910, 5016; 1913 (est.), 5800.

ALBION, NEW. The name given by Sir Francis Drake to the western coast of North America, which he visited in 1579. It was originally applied to the whole region including the peninsula of Lower California, but was restricted by Humboldt and other geographers to the section actually explored by Drake between San Francisco Bay and the Columbia River. Consult the map in the Hakluyt Society's edition of Fletcher's *World Encompassed by Sir Francis Drake*.

AL'BION AND ALBA'NIUS. An opera or masque by John Dryden, written to celebrate the successes of the Stuarts after the restoration. It was produced, with music by Louis Grabu, in 1685, and first published the same year. It is an allegory, with classical nomenclature. Albion represents Charles II; and Albanus, James, the Duke of York.

ALBION COLLEGE. An American college, situated at Albion, Mich., established as a seminary in 1835 and organized as a college in 1861. In 1912 it had 27 professors and instructors, and 331 students in the college department, 134 in the schools of music and painting, 91 in the business department, and 68 in the preparatory department. The endowment fund is \$355,000, the value of buildings and grounds \$250,000, and the annual income from \$45,000 to \$50,000. The library contains 22,100 volumes and 4300 pamphlets. President, Samuel Dickie, LL.D.

ALBION'S ENGL'LAND. A long narrative poem on English history, by William Warner (c.1558-1609). It was first published in 1586, in four books on legendary incidents from Noah's time to that of William the Conqueror; but other books were successively added, till there were 16, bringing the story down to the reign of James I. Many of its materials have been used by later poets.

ALBISTAN, ä'l'bê-stän', or **EL-BOSTAN,** ël'bê-stän' (Turk. the garden). A town in the Turkish vilayet of Aleppo, about 40 miles north-northeast of Marash, on the small river Jihun (Map: Turkey in Asia, G 3). It is situated in a fertile portion of Anatolia and has a considerable trade in grain. In 1277 there was a bloody battle fought here between the inhabitants and invading Mongols. The town was be-

sieged by the Egyptians late in the fourteenth century. Its population is about 6500.

AL'BITE (Lat. *albus*, white). A sodium feldspar or sodium aluminum silicate, usually white in color, that crystallizes in the triclinic system. It is a constituent of many alkaline rocks and is found extensively in the United States. Certain varieties called moonstones, having a blue chatoyant effect, are cut and polished as gems. See FELDSPAR.

ALBO, ä'l'bô, JOSEPH (c.1380-1444). A Jewish preacher and theologian of Spain. He was born probably at Montreal, Aragon, studied under the speculative philosopher Hasdai Crescas, and in 1413-14 seems to have taken part in the extended theological discussion at Tortosa. He is known chiefly for his apologetic entitled *Ik-karim* ('Principles'), which has exerted wide influence. The work was first published in 1485, was translated into German by Schlesinger (1844), and into English in the *Hebrew Review*, vols. i-iii. Albo reduced to three the basic principles of Judaism: the existence of God, revelation, and divine retribution. Consult Back, *Joseph Albo* (1869), and Tünzer, *Die Religionsphilosophie des Joseph Albo* (1896).

ALBOIN, ä'l'boin (?-c.572 or 573). The founder of the Lombard dominion in Italy. He succeeded his father in 565 A.D. as King of the Lombards, who were at that time settled in Noricum and Pannonia. He first aided Narses against the Ostrogoths and afterward, allying himself with the Avars, attacked the Gepidæ and defeated them in a great battle (566 or 567), slaying their King, Cunimund, with his own hand. On the death of his first wife, Chlotsuinda, he married Rosamund, daughter of Cunimund. He invaded Italy in 568 with his own nation of Lombards, some of the Gepidæ, 20,000 Saxons, and adventurers from other nations; overran Venetia in 568, Liguria in 569, and Etruria in 570, and captured Beneventum in 571. Pavia was conquered in 572, after over three years of siege. During a feast at Verona he made his queen drink out of the skull of her father, which he had converted into a wine-cup. In revenge she incited her paramour, Helmechis, to murder her husband (572 or 573). To escape the fury of the Lombards, Rosamund fled with her associate and the treasure to Longinus, the exarch, at Ravenna. Longinus becoming a suitor for her hand, she administered poison to Helmechis, who, discovering the treachery, caused her to swallow the remainder of the cup, and she died with him. For several centuries the name of Alboin continued to be famous among the German nations, who celebrated his praises in martial songs. See Foulke, *History of the Langobards* (Philadelphia, 1907).

AL'BOLENE. A neutral, bland hydrocarbon oil, of mineral origin, used in medicine to carry remedies intended to be sprayed into the nose and deeper air passages; as a bland dressing for wounds to prevent dressings from adhering to the granulating surface; and sometimes as a mild laxative in place of castor oil or olive oil. See PETROLEUM.

ALBONI, ä'l'bô'nê, MARIETTA (1823-94). An Italian contralto, born at Cesena, in the Romagna, March 10, 1823. A pupil of Madame Bertolotti, and later of Rossini, she made her début at the age of 15 at Bologna as Orsini in *Lucrezia Borgia*, and her success led to an engagement at La Scala, Milan. In 1846-47 she sang in all the principal cities of Europe; in London,

at Covent Garden, in rivalry with Jenny Lind, who was at Her Majesty's Theatre. In 1852 she visited the United States, singing in the chief towns in opera and concert. With the exception of Malibran (q.v.), she was the greatest contralto of the nineteenth century. Her voice, a fine contralto with a compass of two and one-half octaves, ranging as high as mezzo-soprano, possessed at once power, sweetness, fullness, and extraordinary flexibility. In passages requiring elevation and semi-religious calmness she had no peers, owing to the moving quality of her voice. She possessed vivacity, grace, and charm as an actress of the *comédienne* type, but her attempt at a strongly dramatic part, like Norma, turned out a failure. She married Count Pepoli, of the Papal States, but kept her maiden name on the stage, appearing in opera at Munich as late as 1872. Her husband died in 1866, and in 1877 she married M. Zieger, a French officer. She died at Ville d'Avray, near Paris. Consult G. T. Ferris, *Great Singers* (New York, 1893), and A. Pougin, *Marietta Alboni* (Paris, 1912).

AL-BO'RAK. According to the Moslem creed, the animal brought by Gabriel to carry Mohammed to the seventh heaven. It had the face of a man, the body of a horse, the wings of an eagle, and spoke with a human voice.

ALBORNOZ, ä'l'bör-nōth', GIL ALVAREZ CARRILLO DE (c.1310-67). A warlike Spanish prelate. He was born at Cuenca, studied at Toulouse, and subsequently became almoner to Alfonso XI, King of Castile, who appointed him Archdeacon of Calatrava, and in 1337 he was chosen Archbishop of Toledo. He took part in the wars against the Moors, saved the life of the King in the battle of Tarifa, and was present at the siege of Algeciras, where the King dubbed him knight. After the death of the King he went to Pope Clement VI at Avignon, who made him a Cardinal. Innocent VII also recognized his abilities as an astute diplomat and twice sent him as Cardinal-Legate to Rome, where, by his tact and vigor, he secured, in spite of the intricate complications of affairs, the restoration of the papal authority in the States of the Church (1353-62). Pope Urban V felt that he owed the recovery of his dominions mainly to him, and out of gratitude appointed him legate at Bologna, in 1367. In the same year he died, at Viterbo; but as he had expressed a wish to be buried at Toledo, Henry of Castile removed his body with almost royal honors, and Urban even granted an indulgence to all who had assisted in transferring the body from Viterbo to Toledo. He left a valuable work upon the constitution of the Roman church, printed for the first time at Jesi in 1473 and now very rare. By his will he provided for the foundation of the College of Spain at Bologna.

ALBRECHT, ä'l'brëkt. See ALBERT.

ALBRECHTSBERGER, ä'l'brëkts - bërK'ër, JOHANN GEORG (1736-1809). An Austrian musician, one of the most learned contrapuntists of his age. In 1772 he was appointed court organist, and in 1792 kapellmeister of St. Stephen's Cathedral, Vienna. Among his pupils were Beethoven (whose genius he failed to recognize), Hummel, Moscheles, Seyfried, and Weigl. Of his numerous compositions, few ever appeared in print. His most important contributions to music were his theoretical works, the *Gründliche Anweisung zur Komposition* (1818), and *Kurzgefasste Methode, den Generalbass zu erlernen* (1792).

ALBRET, ä'l'brë', JEANNE D' (1528-72). Queen of Navarre, only daughter of Henry II of Navarre, and Margaret, sister of Francis I. Jeanne married Antoine de Bourbon. She was celebrated for her intellectual strength and personal beauty. She embraced Calvinism and, in spite of Spanish menaces and Roman intrigue, kept her possessions. In 1567 she declared the reformed religion established in the kingdom, and in 1569, with her children, Henry, afterward Henry IV of France, and Catherine, she brought a small band of Huguenots to Coligny at La Rochelle, and after the murder of the Prince of Condé she was looked upon as the only support of the Protestants. She wrote prose and verse, and some of her sonnets have been published. Consult *Mémoires et poésies de Jeanne d'Albret* (Paris, 1893) and *Lettres d'Antoine de Bourbon et de Jehanne d'Albret publiées pour la Société de l'histoire de France* (Paris, 1877).

ALBRET, THE LORDSHIP OF, in the Landes, in France. The lords of Albret were prominent in the Hundred Years' War (q.v.), and Charles, Lord of Albret, was commander of the French forces at Agincourt, where he was killed. John of Albret became King of Navarre by his marriage with Catherine de Foix (q.v.). Their son Henry was created Duke of Albret in 1550. His grandson was Henry of Navarre, by whose accession to the French throne the dukedom became united to the crown; but it was granted to the family of La Tour d'Auvergne in 1651.

ALBRIGHT, ô'l'brīt, JACOB (1759-1808). The founder of the Evangelical Association (q.v.). He was born near Pottstown, Pa., May 1, 1759, and died at Mühlbach, Pa., May 8, 1808. In 1792 he joined the Methodist church, in 1796 began his very successful career as preacher among the Germans, and in 1807 was elected first bishop of the church which he founded. For his life, consult Yeakel, *Jacob Albright and his Co-laborers* (Cleveland, 1883).

ALBRIGHT BRETH'REN. See EVANGELICAL ASSOCIATION.

ALBRIGHT COLLEGE. A coeducational institution, under the control of the United Evangelical Church, at Myerstown, Pa., founded in 1895 and consolidated in 1902 with Central Pennsylvania College. It has a classical course, requiring Greek for the A.B. degree, Latin, scientific and chemical-biological courses. It has also a preparatory school and music and art departments. In 1913 the faculty numbered 17, and the students 222. The school has a library of 8000 volumes, property valued at \$140,000, an endowment of \$86,000, and an income of \$34,000. President, J. F. Dunlap, D.D.

ALBRIZZI, ä'l-brët'së, ISABELLA TEOTOCHI, COUNTESS D' (1763-1836). An Italian author. She was born at Corfu, of Greek parentage. As the wife of the Inquisitor of State, Count Giuseppe Albrizzi, her home in Venice became the rendezvous for many celebrities of the day, such as Alfieri, Foscolo, and Byron. With Cicognara, she was one of the first to call attention to the genius of Canova, to whom she paid a glowing tribute in her celebrated work, *Opere di scultura e di plastica di Ant. Canova descritte da J. A.* (1809); also published under the title *Descrizione delle opere di Canova* (5 vols., 1821-25). Her other writings include *Ritratti* (1807, 1826); 17 essays on distinguished contemporaries, and a life of Vittoria Colonna (1836).

ALBRUNA. A German seer of the time of the Roman Emperor Augustus. She is men-

tioned by Tacitus (*Germania*, viii), and is supposed to have acquired renown during the campaigns of Drusus and Tiberius. Albruna is the same as the Old Norse *alfruna* and the Anglo-Saxon *helrun* and is the collective term for the wise women of the ancient Germans.

AL'BUCA'SIS. See ABU'L KASIM.

ALBUERA, ăl-bwā'rá. A hamlet in the Spanish province of Badajoz, famous for the battle of May 16, 1811, between the combined English, Spanish, and Portuguese forces under General Beresford, and the French under Marshal Soult, who were not so numerous as the allies, but had abundant artillery. The object of the French was to compel the English to raise the siege of Badajoz. The result was that Soult was obliged to retreat to Seville with the loss of 8000 men; the loss of the allied forces was about 7000. In proportion to the numbers engaged, the battle was the most sanguinary in the whole contest. Of 6000 British who charged the French entrenchments, only 1500 remained unwounded.

ALBUFERA, ăl'bōō-fā'rá (Ar. *al*, the + *bu-haira*, coast-lake). A lake near Valencia, in Spain, about 10 miles in length and 4 miles in breadth. It is separated from the sea by a narrow tongue of land, and a canal connects it with the city of Valencia (Map: Spain, E 3). Its fish and game birds attract sportsmen, and it is said to have been excavated by the Moors. From it Marshal Suchet (q.v.) took the title of duke.

ALBU'GO. See LEUCOMA.

ALBULA, ăl'bu-lá. A river in the canton of Grison, or Graubünden, Switzerland (Map: Switzerland, D 2). The Albula is the largest tributary of the Hinter Rhine and rises in Albula Pass, flowing through the Albula valley to empty into the Hinter Rhine after a course of 29 miles. Its outlet is 4500 feet lower than its source.

AL'BULÆ A'QUÆ. Sulphur springs near ancient Tibur (see TIVOLI), much used by invalids for bathing and drinking. Three still remain, forming the lakes known as Bagni di Tivoli.

ALBULA PASS. A high, rocky pass in which rises the Albula River, Switzerland (Map: Switzerland, D 2). It is situated 7600 feet above sea level and lies between the peak of Crasta Mora (9600 feet high) and the Pitz Urtsch or Albulahorn (10,700 feet high). Over it runs the road from Tiefenkasten to Ponte, the shortest route into the Engadine. The opening of a railway line through the pass in 1903 established its importance as a route for trade.

AL'BUM (Lat., neut. of *albus*, white). Among the Romans, a wooden tablet whitened with gypsum, on which were written in black letters the *Annales Maximi* of the pontifex (see ANNALS), the *acta* (q.v.) of the magistrates, etc., edicts of the prætor, and public announcements generally. The word was also applied to the contents of such a board, and, since lists of corporations had to be published, album came to denote any such catalogue; e.g., *Album Senatorium*, the official list of the Senate. In the Middle Ages the word was used to denote any list, catalogue, or register, whether of saints, soldiers, or civil functionaries. In the gymnasia and the universities on the Continent, the list of the names of the members is called the album. The name is also applied to the "black board" on which public notifications of lectures, etc.,

are written up. But its popular signification in modern times is that of a book for containing photographs, or a blank book for a drawing-room table, intended to receive fugitive pieces of verse, or the signatures of distinguished persons, or sometimes merely drawings.

ALBUMAZAR, ăl'bōō-mä'zēr (805-885). An Arabian astrologer, born at Balkh, whose true name was ABOU-MASCHAR DJAFAR IBN-MOHAMMED. He believed that the world was created when the seven planets were in conjunction in the first degree of Aries and that it would be destroyed when they are again in conjunction in the last degree of Pisces. He is the author of more than 50 works, several of which have been translated into Latin. Of the latter are: *Flores Astrologici* (1488); *De Magnis Conjunctionibus, Annorum Revolutionibus ac eorum Projectionibus* (1489); *Introductorium in Astronomiam* (1506).

ALBU'MEN (Lat. the white of an egg, from *albus*, white). In plants, a name formerly applied to the nutritive tissue of seeds, now commonly known as "endosperm." See SEED.

ALBUMEN, or **ALBUMIN**. The most important ingredient in the white of egg. It abounds in the blood and more or less in all the serous fluids of the animal body. It also exists in the sap of vegetables and in their seeds and edible parts. Albumen is often used as a mordant, to fasten various colors on cotton. It is prepared industrially in considerable quantities by drying the white of egg without allowing it to coagulate. For this purpose the white of egg is placed in shallow vessels and kept at a temperature of about 50° C. (122° F.) in well-ventilated chambers. Unless coagulation has taken place, the dried albumen remains completely soluble in water. Albumen is used in photographic printing, and its property of coagulating with heat into an insoluble variety renders it useful in clarifying solutions, as in sugar refining. An aqueous solution of albumen shows the characteristic biuret reaction; if, namely, one adds to a solution containing albumen some caustic alkali and then, drop by drop, some dilute copper sulphate solution, the mixture assumes a reddish color, which gradually turns reddish-violet and violet-blue. However, the biuret test alone does not positively prove the presence of albumen, as many other substances, for instance, those containing the groups CH₂NH₂, CONH₂, CSNH₂, etc., give the same reaction. For this reason it is important to supplement the biuret reaction with one or more other tests: for instance, treatment with concentrated sulphuric acid and a little sugar, which shows a pretty red color if albumen is present. With corrosive sublimate (bichloride of mercury) and other poisonous salts, albumen forms insoluble compounds; it is, therefore, often used in medicine as an antidote. Consult Schryver, *Chemistry of the Albumens* (London, 1906). See ALBUMINURIA.

ALBU'MINOIDS. See PROTEIDS.

AL'BUMINU'RIA (Lat. *albumen* + Gk. *ούρον*, *ouron*, Lat. *urina*, urine). Generally, a symptom of disease of the kidneys; notably Bright's disease (nephritis). It consists of the presence of albumen in the urine. Tests for albuminuria: (1) Pour into a small test tube a little fresh urine, then gently add about one-half the same amount of cold nitric acid. The presence of a white ring at the junction of the liquids indicates albumen. (2) Partly fill a test tube with

fresh urine; add a few drops of acetic acid; boil the top of the liquid. Coagulation indicates the presence of albumen. Physiological albuminuria occurs in young adults, after muscular exercise, and also in some people after cold baths and during indigestion. It may not always be present, even in severe Bright's disease, and it is not necessarily an indication of disease. See BRIGHT'S DISEASE.

ALBUÑOL, ä'l'bōōn-yōl'. A town of Spain, in the province of Granada, 41 miles southeast of Granada, and about 3 miles from the coast of the Mediterranean (Map: Spain, D 4). It is a well-built town, with clean, paved streets. There are lead mines in the surrounding district, which abounds also in vineyards and is very productive of figs and almonds. The making of wine and brandy and the drying of raisins are the chief occupations of the inhabitants of the town itself. Pop., 1900, 9356; 1910, 7749. The port of Albuñol is a small place called Rábita.

ALBUQUERQUE, Eng. pron. ä'l'bū-kūr'kê. The largest city of New Mexico and the county-seat of Bernalillo Co., on the Rio Grande, 60 miles (direct) southwest of Sante Fe, and on the Atchison, Topeka, and Santa Fe, and the Santa Fe and New Mexico Central railroads (Map: New Mexico, C 3). It has an elevation of 5000 feet, and, on account of the climate, which is especially adapted for the treatment of tuberculosis, is an excellent health resort and attracts from 3000 to 4000 persons annually between October and May. It is the seat of the University of New Mexico, organized 1889, a government school for Indians, founded 1881, six large sanitoriums, and eight denominational and mission schools. The lumber interests are very extensive, and there are railroad shops, a large Indian trading company, a woolen mill, a tie-preserving plant, flour mills, foundries, machine shops, cigar factories, mineral water establishments, etc. Other industries of the city are truck farming, fruit growing, and the mining of lead, zinc, gold, and copper. Albuquerque was founded in 1706, was named in honor of Affonso de Albuquerque, then Viceroy of New Mexico, and was a prominent settlement during the Spanish régime. The church of San Felipe de Neri, established in 1658, still stands. Other notable features are the Harvey Indian Muscum, said to contain the finest basket and blanket collection in existence; the federal building; and the Isleta Indian Pueblo. The new town really dates from 1880, and was incorporated as a city in 1892. The mayor is elected annually, and the city council is composed of eight members. The gradual enlargement of the Santa Fe railroad shops is responsible for a continual growth. Pop., 1890, 3785; 1900, 6238; 1910, 11,020; 1913 (est.), 18,000.

ALBUQUERQUE, AFFONSO DE, THE GREAT (1453-1515). Viceroy of the Portuguese Indies. He was born at Alhandra, a town near Lisbon, and is known in the national epics as "the Portuguese Mars" and as "the Portuguese Cæsar." Albuquerque spent his youth in attendance at the palace of King Alfonso V. He took part in the expedition against the Turks, which terminated in the victory of the Christians at Otranto in 1481. In 1489 he became Chief Equerry to King John II. He was assigned to duty on the Indian fleet of 1503 and acquitted himself with such discretion that King Emanuel appointed him Viceroy of the Portuguese possessions in the East in 1506. His predecessor, Francisco de

Almeida (q.v.), refused to give up his office, however, and sent Albuquerque as a prisoner to Cananore. In October, 1509, he was released and took over the authority of the Viceroy. Albuquerque captured the fortress of Goa, Feb. 16, 1510, but was forced to evacuate it and retire to Panjim, where he awaited reënforcements from Europe, with whose help, on Nov. 26, 1510, he recaptured the city, which has ever since been the chief seat of Portuguese power and commerce in the East. He gradually completed the conquest of Malabar, Ceylon, the Sunda Isles, the peninsula of Malacca, and (in 1515) the island of Ormuz, at the entrance of the Persian Gulf. He made the Portuguese name respected in the East, and many of the princes, especially the kings of Siam and Pegu, sought his alliance and protection. He maintained strict military discipline, was active, humane, respected, feared by his neighbors, and beloved by his subjects. Notwithstanding his valuable services, Albuquerque did not escape the envy of the courtiers and the suspicions of King Emanuel, who appointed Lopez Soarez, a personal enemy of Albuquerque, to supersede him as Viceroy. This ingratitude affected him deeply. Ishmaël, the Shah of Persia, offered his assistance to resist the arbitrary decree of the Portuguese court, but Albuquerque would not violate his allegiance. A few days afterward, commending his son to the King in a short letter, he died at sea near Goa, Dec. 16, 1515. Emanuel honored his memory and raised his son to the highest dignities in the State. This son, whose name, Braz, or Blasius, was altered to Affonso after his father's death, compiled from the official dispatches and private letters of the Viceroy the *Commentarios do Grande Affonso d'Albuquerque* (printed in Lisbon in 1557; reprinted in 1576 and 1774). A translation, edited by W. de G. Birch, published by the Hakluyt Society of London, in four volumes, 1875-84, is the standard authority for this period of Indian history. See also Stephens, *Albuquerque and the Early Portuguese Settlements in India* (London, 1892), id., *Albuquerque* (Oxford, 1905), and Keller, *Colonization* (Boston, 1908).

ALBUR'NUM (Lat. sap-wood, from *albus*, white). An old name for the sap-wood of ordinary trees (Dicotyledons and Conifers). As the tree adds new layers of wood, the ascending sap abandons the deeper-seated layers, which also become modified through age. This leads usually to a sharp contrast in the appearance of the two regions, the outer region traversed by the sap (*alburnum*) being lighter in color and consisting of thinner-walled cells than does the older heart wood or "duramen." See **WOOD**.

ALBURQUERQUE, ä'l'bōō-kēr'ká (Sp. from Lat. *albus*, white + *quercus*, oak-tree). A town of Estremadura, Spain, in the province of Badajoz, 24 miles north of Badajoz, and about 10 miles from the Portuguese frontier (Map: Spain, B 3). It was once fortified. There are factories of tanned leather, soap, chocolate, pottery, and oil, and flour mills. The soil produces rye, grapes, and olives, and there are forests of oak and cork trees. Cattle fairs are held here in May and September. Pop., 1900, 6338; 1910, 11,141.

ALBURY, ä'l'bēr-ī. A town of New South Wales, on the Murray River, connected with Victoria by two bridges (Map: New South Wales, G 6). The Murray is navigable by steamers to Albury, which is 1800 miles from

the river's mouth and 190 miles by rail from Melbourne, and 386 miles by rail from Sydney. The town is well known for the wines made in the surrounding districts, from which it also derives considerable trade in agricultural and mineral products. Pop., 1911, 6309.

ALCÆ'US (Gk. Ἀλκαῖος, *Alkaios*). One of the first lyric poets of Greece and contemporary with Sappho. He was a native of Mitylene, on the island of Lesbos, and flourished at the end of the seventh and the beginning of the sixth century B.C. Alcæus was of aristocratic birth and became a leader against the tyrants of his native city, Myrsilus and Melanchrus. Banished from home, he traveled, it is said, as far as Thrace and Egypt. While he was absent, a former comrade in arms, Pittacus, was called to the head of the State by the people, whereupon Alcæus took up arms against him as a tyrant; but in attempting to force his way back he was captured by Pittacus, who, however, generously granted him life and freedom; his last years he spent in Mitylene. Alcæus's odes in the Æolic dialect (see ÆOLIANS)—arranged in 10 books by the Alexandrians—contained political songs bearing on the struggles against the tyrants (some of these he wrote while in exile), hymns, and drinking and love songs. Only fragments remain. Alcæus invented the form of stanza which is named after him, the Alcaic; this Horace, the most successful of his imitators, transplanted into the Latin language (see ALCAICS). The fragments were collected in Bergk's *Poetæ Lyrici Græci*, vol. iii, 4th ed., pp. 147ff. (Leipzig, 1882). Consult Smyth, *Greek Metric Poets* (New York, 1900).

ALCA'HEST. See ALCHEMY.

ALCA'ICS. Certain kinds of Greek and Latin Logædic verse, named from the poet Alcæus (q.v.), their reputed inventor. In Greek the greater Alcaic consists of a preliminary syllable (*anacrusis*), a trochaic dipody, cyclic dactyl, and trochaic dipody catalectic:

∫ : — ∪ | — ∪ | — ∪ ∪ | — ∪ | — ∪

The lesser Alcaic is composed of two cyclic dactyls and a trochaic dipody acatalectic,

— ∪ ∪ | — ∪ ∪ | — ∪ | — ∪

The Alcaic stanza consists of two greater Alcaics, a trochaic quarternarius, with anacrusis,

∫ : — ∪ | — ∪ | — ∪ | — ∪

and a lesser Alcaic.

In Horace the second foot in the first three verses of the stanza is an irrational spondee (— >), so that the Alcaic stanza in Horace runs as follows (compare, e.g., Odes 3, 3, 1-4):

Ius : tum et te|nacem | proposi|ti vi|rum
non : civium | ardor | prava iu | benti | um,
non : voltus | instan|tis ty | ranni
mente qua|tit soli|da, neque | Auster

ALCAIDE, ăl-kād'; *Sp. pron.* ăl-kī'dā (*Sp.* from *Ar. al*, the + *qāid*, governor), or **ALCAYDE**. A Moorish title, applied by Spanish and Portuguese writers to a military officer having charge of a fortress, prison, or town. It has also been used to designate a jailer. It is to be distinguished from *alcalde*, which indicates a civil officer.

ALCALA DE GUADAIRA, ăl'kă-lä' dă gwă-dī'ră (*Ar. al*, the + *Kal'at*, *Kal'ah*, castle + *Sp. de*, of). The ancient Carthaginian Hienippa (place of many springs). A town of Andalusia,

Spain, in the province of Seville, 7 miles east of Seville, partly on a hill, and overlooked by the ruins of an ancient Moorish castle, once one of the most important, as its ruins are still among the finest, in Spain (Map: Spain, C 4). The town is beautifully situated, and on account of the salubrity of the climate is much resorted to as a summer residence by the inhabitants of Seville. It is celebrated for producing a fine grade of bread. There are over 200 flour mills and numerous bakeries in the town which supply Seville. Water comes from a hill above Alcalá, which is perforated by tunnels, forming underground canals. Some of the tunnels are believed to be Roman works, but most of them are known to have been made by the Moors. Pop., 1900, 8287; 1910, 8940.

ALCALÁ DE HENARES, ă-nă'rēs. An old town in Spain, in the province of Madrid, situated on the Henares, 22 miles from the city of Madrid (Map: Spain, D 2). It formerly had a university, founded by Cardinal Ximenes in 1510, and once enjoyed a world-wide fame, second to that of Salamanca alone, which at one period it actually surpassed. In 1836 the university, together with its library, was removed to Madrid. In this library was deposited the original of the celebrated polyglot Bible, which was printed in this town, and called the Complutensian, from the ancient name of the place (Complutum). Alcalá de Henares has, besides, a cavalry school, several interesting churches, and a prison for 800 female convicts, the only institution of its kind in Spain. Its industries include a linen thread factory, soap works, weaving mills of various kinds, and a large leather factory. It is the birthplace of Cervantes, of the Emperor Ferdinand I, and of Catharine of Aragon, first wife of Henry VIII of England. Pop., 1900, 12,056; 1910, 11,728. Consult Calleja, "Bosquejo Histórico de los Colegios Seculares de la Universidad de Alcalá de Henares," in vol. cxvi *Revista Contemporanea* (Madrid, 1899), and Quesada, *Alcalá de Henares* (Buenos Ayres, 1905).

ALCALA LA REAL, lä rä-äl' (*Ar. al*, the + *Kal'at*, *Kal'ah*, castle, fortress, and *Sp. la*, the + *real*, royal). A city of Andalusia, Spain, in the province of Jaen, 26 miles northwest of Granada (Map: Spain, D 4). It is situated on a conical hill, in a narrow valley, on the north side of the mountains which separate the province of Jaen from that of Granada, at an elevation of over 3000 feet above sea level. It is very picturesque, irregularly built, with steep and narrow streets and bold towers, and it has a hospital, formerly an abbey, a very fine building. The neighborhood produces grain, olives, wine, and fruit of the finest quality, and the inhabitants are mostly engaged in agriculture. Brandies, flour, and soap are manufactured. There are many electrical plants. Pop., 1900, 15,948; 1910, 17,046. The town first appears in history under the name of *Al Kalá de Bcū Zaida*, which was the name of its Moorish lord. In 1341 the place was captured by Alfonso XI, who conferred upon it the title of *La Real*.

ALCALDE, ăl-käl'dă (*Sp.*, from *Ar. al*, the + *qādī*, judge). The general title of judicial and magisterial office. It is still used in Spain and in countries in America settled by the Spaniards. The mayor of the *pueblo* or town is called the *alcalde* and is invested with judicial as well as executive powers.

ALCAM'ENES (Gk. Ἀλκαμένης, *Alkamenēs*).

A famous Athenian sculptor, said to have been a pupil of Phidias. His latest work is dated in 403 B.C., but his most famous works seem to have been executed from 440 to 430 B.C. His greatest achievement was the "Aphrodite in the Garden" at Athens, of which the "Venus Genetrix" statues are probably copies. If Pausanias (q.v.) is right (5, 10, 8) in attributing to an Alcamenes the sculptures in the west pediment of the temple of Zeus, at Olympia, and a statue of Hera in a temple on the road to Phaleron which was destroyed by the Persians, we must assume that there was also an older sculptor of the same name. See GREEK ART.

ALCAMO, ä'l'ká-mō. A city in Sicily, 840 feet above the sea, and 52 miles by rail, plus 5 miles by highway, southwest of Palermo (Map: Italy, G 10). It has an Oriental appearance in spite of the fact that in 1233, after an insurrection, Frederick II substituted Christian for Saracenic population. The campanile of the cathedral contains a "Crucifixion" by Gagini; the church of San Francisco, statues of the Renaissance period; and the church Dei Minori, a "Madonna" by Rozzalone. Above the town to the south towers Mount Bonifato to the height of 2700 feet, from which is a magnificent prospect of the Bay of Castellamare. The country is agriculturally rich. Pop., 1881, 37,697; 1901, 51,798; 1911, 32,211. Consult "Documenti sulle chiese di Alcamo" in *Archivio Storico Siciliano*, vol. xxv (Palermo, 1900).

ALCANDRE, ä'l'kän'dr'. In Mademoiselle de Scudéry's *Clélie, Histoire Romaine*, a character representing the young Louis XIV.

ALCÁNTARA, ä'l-kän'tä-rä (Ar. *al*, the + *kantarāh*, bridge). Sometimes identified, but erroneously, as the Norba Casarea of the Romans. An old fortified Spanish town, built by the Moors in the province of Estremadura (Map: Spain, B 3). It is noted for the bridge, which was built by Trajan early in the second century. This is 616 feet long and 190 feet high, with six arches, and was constructed of stone without cement. In 1809 the English partially destroyed the bridge, and it suffered again in the civil war of 1836. From that time until 1860, when it was repaired, the inhabitants used a ferry. Pop., 1900, 3097; 1910, 3654.

ALCANTARA. A seaport town of Brazil, in the State of Maranhão, 17 miles northwest of Maranhão, commanding the north side of the entrance to the bay of S. Marcos (Map: Brazil, J 4). It was formerly the capital of the province, but the shallowness of the harbor has prevented its trade from increasing. There are two salt-pits not far from the town. Coffee, hides, sugar, and salt are exported. Pop., about 10,000.

ALCÁNTARA. A western suburb of Lisbon, where, in 1580, the invading Duke of Alva won a victory over the Portuguese. It is now a part of the city.

ALCANTARA, DOCTOR OF. An opera by Julius Eichberg (q.v.), first presented in Boston in 1862.

ALCANTARA, ORDER OF. A religious and military order of knighthood, established about 1176 on the model of the Templars. In 1197 Pope Celestine III confirmed the privileges of the order, imposing the oaths of obedience, poverty, chastity, and eternal war against the Moors. The order was at first known as the Knights of St. Julian, but in 1217 Alfonso IX gave them the town of Alcántara, which he had taken from the Moors. They settled in this town and were

known as the Order of Alcántara. In time the grand mastership of the Order was united to the Spanish crown by Pope Alexander VI, in 1495, when the former Grand Master was made Archbishop of Toledo and a Cardinal. In 1546 the Knights were allowed to marry, but were obliged to take an oath to defend the Immaculate Conception. For a time in their early history the Knights of Alcántara acknowledged the superiority of the Knights of Calatrava, but later were independent. In 1835 the Order was suppressed and its property confiscated by the State.

ALCARAZ, ä'l'ká-räth'. A town of La Mancha, Spain, in the province of Albacete, 36 miles west-southwest of Albacete (Map: Spain, D 3). It stands on the slope of an isolated hill, on the left bank of the Guadarmena, a feeder of the Guadalquivir. The town owes its importance to copper, tin, and zinc mines in the vicinity, which give employment to some of its inhabitants. There are factories of tanned leather, and brandies, and woolen and linen mills. The town is in a great cattle-producing district. Pop., 1900, 4503; 1910, 5405.

AL'CATRAZ', or **PEL'ICAN ISL'AND**. An island in the Bay of San Francisco, nearly 4 miles northwest of the city. It is 1650 feet in length, and it rises 130 feet above the level of the bay. The United States government maintains upon it important fortifications, which command the entrance to the Golden Gate. On its most elevated point has been erected the highest lighthouse on the Pacific coast.

ALCAVALA, ä'l'ká-vä'lä, or **ALCABALA** (Sp. from Ar. *al*, the + *gabālah*, duty, tax). A duty formerly charged in Spain and her colonies on transfers of property, whether public or private. It was probably instituted in 1341 by Alfonso XI, beginning with 5 to 10 per cent, and by the seventeenth century had increased to 14 per cent of the selling price of all commodities, raw or manufactured, charged as often as they were sold or exchanged. This impost was enforced, despite its ill effect on the commerce of the kingdom, down to the invasion of Napoleon, and indeed, in a modified form, has been continued to the present day. Catalonia and Aragon purchased from Philip V exemption from the tax, and, though still burdened heavily, were in a flourishing state in comparison with districts covered by the alcavala.

ALCAZAR, ä'l-kä'zär; *Sp. pron.* ä'l-kä'thär (Sp. from Ar. *al*, the + *kaṣr*, palace, castle). The name given in Spain to the large palaces built by the Moors, especially royal palaces or those of great emirs. They are often even more in the nature of strongholds than the Florentine palaces, being built around one or more large arcaded courts, with towers at the angles, heavy high walls, and a single gateway with inner and outer gates. Several still exist in the large Spanish cities, dating from Moorish times, as at Malaga, Seville, Toledo, and Segovia. The alcazar differs from the real fortress palace or acropolis fort, called "kal'at" (such as the Alhambra), in being within, instead of outside, the city streets. The term would apply, however, to any palace throughout Mohammedan countries. The best-preserved imitation of this type in Christian art is the princely palace at Ravello, near Naples, built under the influence of Mohammedan art.

ALCAZAR, or **KASR-EL-KEBIR**. A town of Morocco, on the Luccos, 23 miles from its

mouth, at El Araish, on the Atlantic, and 58 miles south of Tangiers. The town is the centre of a fruit-growing district, and wine is manufactured. It was built in the twelfth century and is uninviting because of winter floods which make fever prevalent. The chief edifice is an ancient mosque. King Sebastian of Portugal was defeated and killed here in a battle on Aug. 4, 1578. Early in June, 1911, the Spaniards sent a vessel to El Araish and thence dispatched a column to Alcazar, an act which was resented by powers interested in the Moroccan situation, who claimed violation of existing treaties. Spain denied the charge and defended her action in landing troops on the ground that the movement was aimed solely to defend the city against hostile pretenders and to offer protection to Spanish subjects in a danger-infested city. Pop., about 25,000. See MOROCCO, *History*.

ALCAZAR DE SAN JUAN, ăl-kă'thär dă sän hwän'. A town of Spain, in the province of Ciudad Real, 92 miles by rail from Madrid (Map: Spain, D 3). It lies in a mountainous region in the vicinity of extensive iron mines and soda and alkali deposits. It has a number of soap, dagger, powder, and saltpetre factories and carries on a large trade in wine. The environs of Alcázar are believed to have been described by Cervantes in *Don Quixote*. This town is one of many which claims the author as a native. Pop., 1900, 11,292; 1910, 13,647.

ALCE'DO (Lat.), **ALCY'ONE**, ăl-sī'ō-nē (Gk. Ἀλκυόνη, *Alkyonē*). The names of genera of kingfishers, in allusion to a classic myth. See **ALCYONE** and **KINGFISHER**.

ALCEDO Y HERRERA, ăl-thă'dō é âr-ră'rá, ANTONIO. A Peruvian soldier and historian, whose *Diccionario geográfico-histórico de las Indias Occidentales*, published at Madrid in four volumes (1786-89), supplies much exclusive information concerning the middle period of Spanish-American history. The original work was suppressed by the Spanish government. An English translation by G. A. Thompson (London, 1812-15) contains considerable additions. Alcedo was also the compiler of an important bibliographical work, the *Biblioteca Americana*, the numerous manuscript copies of which are frequently cited by writers on early American bibliography.

ALCESTE, ăl-sĕst'. 1. A character in Molière's play entitled *Le Misanthrope* (q.v.). 2. A name used as a pseudonym by a number of modern French writers, among them Amédée Achard, Alfred Assolant, Louis Belmontet, Hippolyte de Castille, and Edouard Laboulaye. 3. A tragic opera by Gluck, first performed with an Italian text, Dec. 16, 1767, at Vienna. Ten years later it was produced in French at Paris. The printed score appeared in 1768 and contains an elaborate preface in which Gluck lays down the principles that guided him in his reform of the opera. See **GLUCK**; **OPERA**.

ALCESTER, ăl'stĕr, FREDERICK BEAUCHAMP PAGET SEYMOUR, BARON (1821-95). An English admiral. He was born in London, educated at Eton, and entered the navy in 1834. He became a captain in 1854, a rear-admiral in 1870, and an admiral in 1882. In 1880 he was in command of the allied fleet which made a demonstration off the Albanian coast in order to compel the Turks to cede Dulcigno to Montenegro. For this service he was created G. C. B. In the Egyptian War of 1882 he commanded the British

fleet at the bombardment of Alexandria. He was raised to the peerage later in the same year.

ALCES'TIS. See **ADMETUS**.

AL'CHEMIL/LA. See **LADY'S MANTLE**.

AL'CHEMIST, THE. A noted comedy by Ben Jonson, acted in 1610, printed in 1612. It makes a jest of the then popular belief in the philosopher's stone and the elixir of life; its leading character, Subtle, is a quack who deludes Sir Epicure Mammon and other credulous persons till he is finally exposed.

ALCHEMY (Ar. *al*, the + *kīmīyā*, from late Gk. χημ[ε]ία, *chēm[e]ia*; see below and under **CHEMISTRY**). A term applied to the chemistry of the Middle Ages, but more commonly to the search after the transmutation of base metals into gold. "Alchemy," Paracelsus defines, "is the science which teaches how to change one kind of metals into another." The origins of alchemy are buried in remote antiquity. It is impossible to tell when man, surrounded as he is in nature by a great variety of substances and materials, first acquired some knowledge of the properties and transformations of some of these materials, or when he began theorizing about the relationships that almost obviously exist between many of them. A body of knowledge, kept jealously secret, was gradually accumulated by the Egyptian priests and is referred to as the Sacred Art of Egypt. The Egyptians possessed considerable practical knowledge of metallurgy, of the arts of glass-making, bleaching, and embalming; and Mary the Jewess, who was said to have been the sister of Moses, was credited by the alchemists with the invention of a form of the water-bath. There are grounds for believing that the very word "chemistry" is derived from *Chemi*, the most ancient name of Egypt, while the name "Hermetic art," frequently applied to alchemy, is derived from the name of its alleged founder, Hermes Trismegistos, who is believed to have been the Egyptian priest Hermon, of the first century of our era.

The Greek philosophers certainly devoted much speculation to the relationship of the various forms of matter, and the conception that appealed to them most was that of a universe made up of a single primordial matter, of which all substances are but outwardly differing forms. Thales considered water as that primordial substance. Later the idea became current of earth, water, air, and fire, either as distinct elements or as attributes variously associated with a primordial matter, producing the various solids and liquids and rendering these either cold or hot. That the idea of the essential unity of all matter, together with such phenomena as the well-known "transmutation" of ores into metals, should have suggested the transmutation of the commoner metals into gold, is natural; and, as a matter of fact, efforts in this direction began to be made even during the classical period of antiquity. The Arabs, and through them mediæval Europe, inherited both the alluring problem and its underlying conception of the world of matter, and some of the best men of the age devoted themselves to the attack of the transmutation problem with unparalleled perseverance and assiduity. "They are not given to idleness," says Paracelsus, ". . . but diligently follow their labors, sweating whole days and nights by their furnaces."

Practical contact with natural phenomena in the laboratory, and continual failure of the main

search, led to a variety of speculative working-assumptions, and these, often supported by nothing but the fame of their authors, turned into dogmas taught with unhesitating assurance as established truth. The mere desire to discover a substance which would help transform common metals into gold begot a universal belief in the actual existence of such a substance, and the "philosopher's stone," "magisterium," or "great elixir" became as much a reality in the alchemist's world as the actual substances which he was handling. Geber, the famous master of Arabian alchemy, taught that matter was composed of three elements: mercury, sulphur, and arsenic, of which the first two are contained in all metals. He, too, imagined the existence of a further substance; only, Geber's "magisterium" had the power of curing all disease.

Subsequently the properties of the different magisteria were assumed to be possessed by one and the same substance, and the belief spread that the philosopher's stone could transmute all metals into gold, as well as cure all diseases, restore youth, and indefinitely prolong life. At times one or more of these interesting properties were attributed to some actually known substance. Thus, a solution of gold was believed by Geber, Roger Bacon, and many others to be the very elixir of life, and Raymond Lully was inclined to attribute the same power to alcohol. Paracelsus believed in the existence of an "alcahest," a substance possessing, not only the several properties of the philosopher's stone, but also the power of dissolving everything placed in contact with it. According to Paracelsus, whichever of the four kinds—salts, sulphurs, mercuries, or mixts—a given substance may belong to, it also contains the alcahest, or "quintessence."

A pure metal, as we conceive it to-day, contains nothing but itself; it is, as we sometimes say, 100 per cent pure. The alchemist had no such definite conception, and such expressions as "a gold *infinitely* superior to any heretofore seen" are but too frequently met with in alchemical literature. Of course, the adept might expect anything he desired in a substance purified to infinity: many expected to find the *soul* of the substance altogether free from material dross. But the intellectual chaos in which the alchemists were groping in their researches was still further deepened by the obscurity of language employed in the publications of the period. Not only, as Kunckel complained, was the sulphur of one writer not the sulphur of another, but the sages seemed to feel a certain delicacy about uncovering the nakedness of truth to the gaze of the vulgar and quite intentionally obscured the meaning of their utterances. Needless to say, the initiated suffered more than the vulgar from this cabalistic obscuration of style.

Astrological superstition added a further share to the confusion of thought, and the adverse position of the planets was often held responsible for the failure of a "projection." Above all, however, the growth of correct knowledge was impeded by widespread fraud and imposture among the adepts. For while many, especially among the earlier alchemists, were prompted by genuine scientific curiosity and carried on the search of the "stone" in all sincerity, making important inventions and discoveries in course of their search, not a few made use of the Hermetic art for extortionary purposes. A notorious example of the latter class is Giuseppe

Balsamo, better known as Count Cagliostro, who, with the aid of his beautiful wife and other confederates, amassed a great fortune by demonstrations of the art of changing common metals into gold and by similar practices. False stories, too, abounded in alchemical literature. Raymond Lully must have been genuinely affected when he observed the "transmutation" of iron into copper on plunging a bar of iron into a solution of copper salt. But Helvetius is plainly prevaricating when he describes in minute detail how, in January, 1667, he obtained from the Hermetic artist Elias—a man of middle height, honest, grave countenance, straight black hair, etc.—a small piece of the philosopher's stone, sufficient to change just six drams of lead into gold; how he, Helvetius, and his wife melted that quantity of lead in a crucible and added the stone; whereupon, in a quarter of an hour, he "found that the whole mass of lead had been turned into the finest gold"!

In the light of the recent conception of the atoms of matter as constituted by large numbers of the still smaller atoms of electricity, the ancient belief in the essential unity of all substances cannot be scoffed at. To be sure, our modern treasure of definition and practical analytical method renders alchemical practices in the narrower sense of the term quite absurd and robs of all reason the existence of such an organization as the present-day "Alchemical Society of France." The substances which we class as elements have passed essentially unchanged through a myriad of chemical and physical processes; they are not affected by violently explosive chemical reactions, nor by powerful galvanic currents, nor by the heat of the electric arc or even of the sun. Only radioactivity, a process before which we still remain as passive spectators, unable either to arrest it or bring it about at will, has demonstrated the possibility of transmutation in nature. For the formation of the element helium from the element radium, discovered by Sir William Ramsay, is a genuine and thoroughly established transmutation of one chemical element into another.

Consult: Justus von Liebig, *Familiar Letters on Chemistry*, original in German, exists in translations (London, 1851); F. Hofer, *Histoire de la chimie* (Paris, 1869); G. F. Rodwell, *The Birth of Chemistry* (London, 1874); Berthelot, *Les origines de l'alchimie* (Paris, 1885); Berthelot et Ruelle, *Collection des anciens alchimistes grecs* (4 vols., Paris, 1887-88); Kopp, *Die Alchemie in älterer und neuerer Zeit* (2 vols., Heidelberg, 1886); Berthelot, *Introduction à l'étude de la chimie des anciens et du moyen âge* (Paris, 1889); Berthelot, *La chimie au moyen âge* (3 vols., Paris, 1893); *The Hermetic and Alchemical Writings of Bombast of Hohenheim* (Paracelsus), trans. by A. E. Waite (2 vols., London, 1894); M. M. Pattison Muir, *The Alchemical Essence and the Chemical Element* (London and New York, 1894); M. M. Pattison Muir, *The Story of Alchemy and the Beginnings of Chemistry* (New York, 1903); Redgrave, *Alchemy, Ancient and Modern* (London, 1911). As an example of twentieth-century alchemical writing, consult F. Jollivet Castellet, *La Science Alchimique* (Paris, 1904).

ALCHYMIST, DER, dër ä'l'ké-mést. A German opera by Spohr, the text being by Pfeiffer, produced at Cassel, July 28, 1830. It is founded on Washington Irving's tale of *The Alchemist*.

ALCIATI, ä'l-chä'tè, ANDREA (1492-1550).

An Italian juriconsult of the Renaissance, successively professor of law in the universities of Avignon, Bourges, Bologna, Pavia, and Ferrara. He improved the method of studying Roman law by substituting historical research for the servile forms of the glossarists. He wrote many legal works, including commentaries on the Code of Justinian and the Decretals, a history of Milan, notes on Tacitus and Plautus, and a *Book of Emblems* (1522), or moral sayings, in Latin verse, which has been greatly admired. Consult Ernst von Mueller, *Andreas Alciati* (1907).

ALCIBIADES, ăl'si-bi'ä-dēz. A tragedy in five acts by Thomas Otway, produced in 1675 at Dorset Garden Theatre, London, with Betterton in the title rôle.

ALCIBIADES (Gk. Ἀλκιβιάδης, *Alkibiadēs*) (c.450–404 B.C.). An Athenian politician and general. He was the son of Clinias and Dinomache, and belonged to the class of the Eupatridæ. He was born at Athens, lost his father in the battle of Coronea in 446 B.C., and was in consequence educated in the house of Pericles, his uncle. In his youth he gave evidence of his future greatness, excelling both in mental and bodily exercises. His handsome person, his distinguished parentage, and the high position of Pericles procured him a multitude of friends and admirers. Socrates was one of the former and gained considerable influence over him, but was unable to restrain his love of luxury and dissipation, which found ample means of gratification in the wealth that accrued to him by his union with Hipparete, the daughter of Hipponicus. His public displays, especially at the Olympic Games, in 420 B.C., were incredibly expensive. He bore arms for the first time in the expedition against Potidæa (432 B.C.), where he was wounded, and where his life was saved by Socrates, a debt which he liquidated eight years after at the battle of Delium by saving, in his turn, the life of the philosopher; but he seems to have taken no considerable part in political matters till after the death of the demagogue Cleon, when Nicias (q.v.) brought about a treaty of peace for 50 years between the Athenians and the Lacedæmonians, 421 B.C. Alcibiades, jealous of the esteem in which Nicias was held, set himself at the head of the war party and persuaded the Athenians to ally themselves with the people of Argos, Elis, and Mantinea, and did all in his power to stir up afresh their old antipathy to Sparta; the allies, however, were defeated at Mantinea in 418. It was at his suggestion that the Athenians, against the vigorous opposition of Nicias, engaged in the celebrated enterprise against Syracuse (q.v.), to the command of which he was elected, with Nicias and Lamachus. But while preparations were being made, it happened that during one night all the statues of Hermes (q.v.) in Athens were mutilated. The enemies of Alcibiades threw the blame of this mischief upon him, but, fearing that, if tried at once, he would be acquitted through the support of the soldiers, with whom he was very popular, postponed impeachment of him till he had set sail for Sicily. They then stirred up the people against him to such a degree that he was recalled in the autumn of 415 B.C. to stand his trial. See **ANDOCIDES**.

On his way home, Alcibiades landed at Thurii in Italy, fled from the fleet, and betook himself to Sparta, where, by conforming to the strict manners of the people, he soon became a favorite. He induced the Lacedæmonians to send assistance

to the Syracusans, under Gylippus (q.v.), persuaded them to occupy permanently a post at Decelea in Attica, to form an alliance with the King of Persia, and, after the unfortunate issue of the Athenian expedition in Sicily, to support the people of Chios in their endeavors to throw off the yoke of Athens. He went thither himself and raised all Ionia in revolt against Athens. But Agis (q.v.) and the other leading men in Sparta, jealous of the success of Alcibiades, ordered their generals in Asia to have him assassinated. Alcibiades discovered this plot and fled to Tissaphernes (q.v.), a Persian satrap, who had orders to act in concert with the Lacedæmonians. He now resumed his old manners, adopted the luxurious habits of Asia, and made himself indispensable to Tissaphernes. He represented to the latter that it was contrary to the interests of Persia entirely to disable the Athenians. He then sent word to the commanders of the Athenian forces at Samos that he would procure for them the friendship of the satrap if they would control the extravagance of the people and commit the government to an oligarchy. This offer was accepted, and in 411 B.C. Pisander (q.v.) was sent to Athens, where he had the supreme power vested in a council of 400 persons. When it appeared, however, that this council had no intention of recalling Alcibiades, the army at Samos chose him as their commander, desiring him to lead them instantly to Athens and overthrow the tyrants. But Alcibiades did not wish to return to his native country till he had rendered it some service, and he accordingly attacked and defeated the Lacedæmonians by sea and land. Tissaphernes now ordered him to be arrested at Sardis on his return, the satrap not wishing the King to imagine that he had been accessory to his doings. But Alcibiades found means to escape, placed himself again at the head of the army, beat the Lacedæmonians and the Persians at Cyzicus, 410 B.C., took Cyzicus, Chalcedon, and Byzantium, restored to the Athenians the dominion of the sea, and then returned to his country (407 B.C.), to which he had been formally invited. He was received with general enthusiasm, as the Athenians attributed to his banishment all the misfortunes that had befallen them.

The triumph of Alcibiades, however, was not destined to last. He was again sent to Asia with 100 ships; but, not being supplied with money for the soldiers' pay, he was obliged to seek assistance at Caria, where he transferred the command in the meantime to Antiochus, who, being lured into an ambushade by Lysander (q.v.), lost his life and part of the ships. The enemies of Alcibiades took advantage of this to accuse him and appoint another commander. Alcibiades went into voluntary exile at Pactye in Thrace, one of the strongholds which he had built out of his earlier spoils. But being threatened here with the power of Lacedæmonia, he removed to Bithynia, with the intention of repairing to Artaxerxes, to gain him over to the interests of his country. At the request of the Thirty Tyrants of Athens, and with the concurrence of the Spartans, Pharnabazus, a satrap of Artaxerxes, received orders to put Alcibiades to death. He was living at this time in a castle in Phrygia; Pharnabazus caused it to be set on fire during the night. As his victim was endeavoring to escape from the flames, he was pierced with a volley of arrows. Thus perished Alcibiades (404 B.C.), about the forty-fifth year

of his age. He was singularly endowed by nature, being possessed of the most fascinating eloquence and having in a rare degree the ability to win and to govern men. Yet in all his transactions he allowed himself to be directed by external circumstances, without having any fixed principles of conduct. On the other hand, he possessed that boldness which arises from conscious superiority, and he shrank from no difficulty, because he was never doubtful concerning the means by which an end might be attained. Consult: The *Lives*, by Plutarch and Nepos; Grote, *History of Greece* (New York, 1853-56); Hertzberg, *Alkibiades, der Staatsmann und Feldherr* (Halle, 1853); Houssaye, *Histoire d'Alcibiade* (2 vols., Paris, 1873). The *Life* by Plutarch has been newly translated, with valuable notes, by B. Perrin (New York, 1912).

ALCÍ'DA: GREENE'S METAMORPHOSES. A pamphlet by Robert Greene, of which the first known edition dates from 1617, though it was licensed in 1588 and probably published soon after. It contains stories illustrating the ills that result from feminine vanities.

ALCID'AMAS (Gk. Ἀλκιδάμας, *Alkidamas*). A Greek rhetorician, pupil of Gorgias and the last of the Sophistical school, of the fourth century B.C. He was a native of Elæa, in Aiolis in Asia Minor, but gave instruction in eloquence at Athens. The only complete extant declamations attributed to him are: Ὀδυσσεύς, in which Odysseus accuses Palamedes of treachery to the Grecian cause during the siege of Troy (compare Vergil, *Æneid*, iii, 81 ff.); and Περὶ Σοφιστῶν, concerning the Sophists. The latter oration, which is said to have been directed chiefly against Isocrates, the contemporary of Alcidas, in support of the teachings of Gorgias, has been published by Blass in his second edition of *Antiphon* (p. 193). The Ὀδυσσεύς, however, was not written by Alcidas. Consult Vahlen, *Der Rhetor Alcidas* (Vienna, 1864), and Blass, *Die Attische Beredsamkeit* (Leipzig, 1892).

ALCI'DES. A patronymic of Hercules, from the name of his grandfather, Alcæus.

AL'CIMUS. A high priest of the Zadokite family, born about 200 B.C., and appointed to his office probably first by Antiochus V, Eupator, and then, after he had been driven away by the Maccabees, by Demetrius Soter (162 B.C.). He was a leader in the Hellenistic party which opposed the Maccabees, and is said on the occasion of the defeat of the latter (April, 160 B.C.) to have torn down the wall of the court of the inner temple at Jerusalem, probably for the purpose of rebuilding it on a more magnificent scale. See the discussions of his career in Wellhausen, *Israelitische und jüdische Geschichte* (4th ed., 1907), and Büchler, *Tobiaden und die Oniaden im II Makkabäerbuche* (Vienna, 1899).

ALCINOUS, āl-sīn'ō-ūs (Gk. Ἀλκίνοος, *Alkinoos*). A mythical King of the mythical Phæacians, grandson of Poseidon. His daughter, Nausicaa, rescued the shipwrecked Odysseus, who was entertained and sent home by Alcinoüs and his Queen, Arete. His people were skilled seamen, but luxurious, and his domain Scheria, a Grecian fairyland. Later tradition identified Scheria with the island of Corcyra (Corfu). Consult Homer, *Odyssey*, vi-viii.

AL'CIPHON (Gk. Ἀλκίφρων, *Alkiphron*). A Greek rhetorician who flourished probably about the close of the second century A.D. He was the author of 118 letters in three books, which pro-

fess to be epistles written by common people—peasants, fishermen, courtesans, and parasites. Various historical personages are named as if living: these all belong to Athens of the fourth century B.C. The scene, too, is always Athens or its neighborhood. The dialect also is Attic, handled in the main with correctness and elegance. Their style is pure and their form excellent; they are valuable as character sketches, which picture clearly Athenian life of the fourth century B.C.; and the letters of the courtesans, being based on the new comedy, especially on lost plays of Menander, assist us to recreate that literature. Edited by Meineke, in *Fragmenta Comicorum Græcorum*, vol. iv (Leipzig, 1853); Wagner (Paris, 1878); and Hercher, in his *Epistolographi Græci* (Paris, 1873). There is an English translation by Beloe (London, 1890).

ALCIPHON. The hero of Thomas Moore's novel, *The Epicurean*, published in 1827, to which was appended, in 1839, the poem entitled *Alciphron*, in which the author had first taken up the theme.

ALCIPHON, or **THE MINUTE' PHILOSOPHER.** A work by Bishop Berkeley, written at his home in Rhode Island, and published in 1732, after his return to England. It is a dialogue, in which Alciphron, a skeptic, is made the chief speaker for the sake of showing the weakness of the infidel's position.

ALCIRA, āl-thē'rá. A town of Spain, in the province of Valencia, 20 miles south by west of Valencia, on an island in the river Júcar (Map: Spain, E 3). It is surrounded by old walls with strong towers. The principal streets are wide, but the town is ill built. The main buildings are three churches, six monasteries, and a theatre. The surrounding country is fertile, and there are groves of orange and palm trees, but, owing to the rice swamps, there is much malaria. Fruit and rice are the principal articles of trade. The many canals admirably illustrate the system of irrigation introduced by the Moors, and the town was one of their important trade centres. It has two fine bridges, and there is a remarkable stalactitic cavern in the vicinity. Pop., 1900, 19,906; 1910, 22,057. Alcira was known in Roman times as Sætaticula and was the chief seat of the tribe of the Contestani. The district about Alcira is sometimes called the garden of the kingdom of Valencia.

ALCMÆ'ON (Gk. Ἀλκμαίων, *Alkmaïōn*). In Greek legend, the son of Amphiaräus (q.v.) and Eriphyle (q.v.), and brother or father of Amphilocheus. He was the leader of the Epigoni (q.v.), who captured Thebes to avenge the death of their fathers in the War of the Seven (see SEVEN AGAINST THEBES). As Eriphyle had betrayed her husband to his death, Amphiaräus ordered his son to kill her. For this act madness came upon Alcmæon, and he was pursued by the Furies. In his flight he came to Psophis, in Arcadia, whose King, Phegeus, sought to purify him and gave him his daughter Arsinoë. Alcmæon gave her the necklace and the peplus of Harmonia, the bribe by which Eriphyle had been induced to persuade Amphiaräus to take part in the War of the Seven. Presently the crops failed, and Alcmæon, uncured and driven by the Furies, went to the river-god Acheloiüs (q.v.), who also purified him and gave him his daughter, Callirhoë. For her he took his gifts from his former wife under pretense of dedicating them at Delphi, that he might be com-

pletely cured. When his father-in-law heard of this deceit, he sent his sons to exact vengeance; they killed Alcmæon, but Alcmæon's sons by Callirhoë took bloody vengeance at her instigation. There are indications of a cult of Alcmæon at Psophis, where his tomb was shown, and at Thebes. Later stories told of Alcmæon's conquest of Acarnania (q.v.), apparently as a mythical prototype of the Corinthian civilization of that region.

ALCMÆON (Gk. Ἀλκμαίων, *Alkmaïōn*). A Greek physician and naturalist, who lived in the latter half of the sixth century B.C. He was a native of Crotona, in Italy, and is said to have been a pupil of Pythagoras. He made important discoveries in anatomy and was the first to practice dissection. He wrote a book *On Nature*, of which we have fragments.

ALC'MÆON'IDÆ (Gk. Ἀλκμαιωνίδαι, *Alkmaïōnidai*, descendants of Alcmæon). A distinguished family in ancient Athens, whose founder, Alcmæon, according to tradition, came from Pylos, Messenia. One of them was the Archon Megacles, who, about 612 B.C., slew the conspirator Cylon and his followers at the altars where they had fled, in spite of his promise to spare them. For this sacrilege the whole family was banished, about 596 B.C. They maintained a conflict for many years with Pisistratus and his sons, however, and in 510 were finally brought back to Athens by the help of the Spartans, who were led to aid them by the partiality of the Delphic oracle. Clisthenes (q.v.), then the head of the family, was the noted legislator. Even more famous members of it were Pericles and Alcibiades.

ALC'MAN (Gk. Ἀλκμάν, *Alkman*). A poet of the second half of the seventh century B.C., who is considered the founder of Dorian lyric (choral) poetry. He was born at Sardis, the capital of Lydia, in Asia Minor, but was probably of Greek extraction. A doubtful tradition said that he was a slave; in any case, he attained a high position at Sparta, where he made his home, and became teacher of the State choruses. In the Hellenistic period six books of his poems were current, comprising pieces called partheneia, hymns, hyporchemes, pæans, erotica, and hymenaia. (See PÆAN.) He was counted the founder of erotic poetry, and reached great perfection in his partheneia. His dialect was the Dorian, but his verses show many Æolian characteristics. Alcman occupied the first place in the Alexandrian Canon. The bucolic poets regarded him as their predecessor, and we know that he was read with pleasure in the second century A.D., although his dialect was then considered harsh and unmusical. Only fragments of his poetry remain, edited in Bergk's *Poetæ Lyrici Græci*, vol. iii, pp. 14 ff. (4th ed., Leipzig, 1882); a fragment discovered in 1896 is published in *Oxyrhynchus Papyri*, vol. i. No. VIII. See also H. W. Smyth, *Greek Melic Poets* (New York, 1900).

ALCME'NE, ãlk-mē'nē (Gk. Ἀλκμήνη, *Alk-mēnē*). In Greek mythology, the daughter of Electryon, King of Mycenæ, and wife of Amphitryon (q.v.), mother of Heracles, by Zeus, who came to her in the form of her husband. This story is well told in the *Amphitruo* of Plautus (q.v.). She was the mother of Iphicles by Amphitryon.

AL'CO (native name). A small, long-haired dog of tropical America, known both wild and in a domesticated condition. In the latter state

it is gentle and home-keeping; and as its ears are pendulous it is considered by most authorities as a species introduced in the early days of the Spanish conquest and since become partly feral. Consult Gosse, *A Naturalist's Sojourn in Jamaica* (London, 1851).

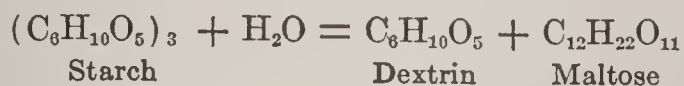
ALCOBAÇA, ãl'kõ-bã'sã. A town in the province of Estremadura, Portugal, situated between the Alcoa and Baca rivers, 4 miles east of Vallado, the nearest railway station. On the west Alcobaca is dominated by a range of hills crowned with Moorish ruins. The most notable feature of the town is the Cistercian abbey of Santa Maria, one of the finest and richest monasteries in the world. It contains the tombs of Inez de Castro and of some Portuguese monarchs. The buildings comprise an imposing church, in early Gothic, five cloisters, seven dormitories, a library containing over 25,000 volumes, and a hospedaria. It is supplied with water by a tributary of the Alcoa, which flows through the enormous kitchen. The abbey was built from 1148 to 1222, was sacked by the French in 1810, and was secularized in 1834. The north part of the structure is now used as a barracks for cavalry. Pop., 1900, 1562.

ALCOCK, ãl'kõk, Sir RUTHERFORD (1809-97). An English diplomatist and author, born in London. He studied medicine and became distinguished as an army surgeon and hospital inspector and afterward as a lecturer on surgery. In 1844 he was sent as British Consul to China, and he served in Amoy, Fuchow, and Shanghai. He won such distinction in these services that, in 1858, he was made Consul-General in Japan. Here great difficulties were experienced: Japan was in a state of feudal anarchy, assassination was rife, Englishmen treacherously assaulted, the British legation itself twice attacked and once burned, yet Alcock stood by his post. Under his influence, Shimonoseki was bombarded in 1864, after which, the Yeddo government refusing to open more ports to trade, an indemnity of \$3,000,000 was extorted, part of which was paid by the Mikado's government in 1874. Recalled in 1865 from Japan, he was appointed Minister Plenipotentiary to Peking and served from 1865 to 1871. It was Alcock who first brought Japanese art to the world's notice, in the London World's Exposition (1862). He was, from 1876, for a long time the president of the Royal Geographical Society. His publications include *Life's Problems; The Capital of the Tycoon* (1863), *Art and Industries in Japan* (1878), and many geographical and other articles in periodicals. For further account of his career, consult R. J. Mitchie, *An Englishman in China during the Victorian Era* (Edinburgh, 1900).

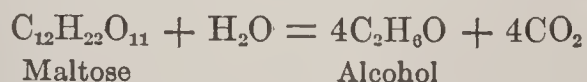
ALCOFRIBAS NASIER, ãl'kõ'frë'bã' nã'syã'. The pseudonym, formed anagrammatically from his own name, under which François Rabelais published his *Pantagruel*, etc.

AL'COHOL (Ar. *al*, the + *kohl*, exceedingly fine powder of antimony for painting eyebrows; hence the quintessence of something; finally rectified spirits, alcohol), or **ETH'YL ALCOHOL**, C₂H₅OH, often called spirits of wine. A chemical compound of carbon, hydrogen, and oxygen that has been known and extensively used from the earliest times. It is consumed in very large quantities in the form of intoxicating liquors and is used for various purposes in the arts and manufactures. The alcohol of commerce, in its various forms, is all made by fermentation.

Natural products containing a large amount of starch, such as grain, rice, potatoes, etc., are reduced with water to a paste, and a small quantity of malt is added to produce fermentation, by which the starch is in a short time transformed into dextrin and a kind of sugar called maltose, according to the following chemical equation:



Then yeast, which consists of living plant cells, is added to set up a new process of fermentation, by which the maltose is converted into alcohol, according to the following chemical equation:



The manufacture of alcohol thus involves two distinct processes of fermentation; for neither can alcohol be obtained from maltose by the action of the *diastase* of malt, nor can maltose be obtained from starch by the action of yeast. Small quantities of organic substances are usually produced along with ethyl alcohol during fermentation; one of these is the well-known *fusel oil*, a mixture of alcohols chemically allied to ordinary alcohol and containing mainly amyl alcohols. (See AMYL ALCOHOL.) A small quantity of fusel oil is contained even in the "raw spirit," a strong alcohol obtained by distilling the weak solution obtained through fermentation. To free the raw spirit from fusel oil, which is highly injurious, it is mixed with water, filtered through charcoal, and subjected to a process of fractional distillation, the intermediate fractions, called rectified spirit, being practically free from fusel oil. The presence of the latter in spirituous liquors may be readily detected by adding a few drops of colorless aniline and two or three drops of sulphuric acid, a deep-red coloration being produced in the presence of fusel oil. The flavor of alcoholic beverages is due to the presence of various organic substances often produced by modifying the process of manufacture. Thus both the flavor and color of beer depend largely on the temperature and duration of heating of the malt before using it; the flavor of Scotch whisky is derived mainly from the peat used in drying the malt, etc. The quantity of alcohol contained in various beverages is very different: gin, rum, and the strong liquors contain from 40 to 50 per cent of alcohol; port contains from 15 to 25 per cent; sherry or madeira, from 15 to 20 per cent; champagne and burgundy, from 10 to 13 per cent; hock, from 10 to 12 per cent; claret, from 8 to 12 per cent; cider and strong ale, 5 to 9 per cent; beer or porter, from 2 to 5 per cent; koumyss, from 1 to 3 per cent. The *United States Pharmacopœia* fixes the specific gravity of rectified spirit at 0.820, which corresponds to 91 per cent of absolute alcohol. The amount of alcohol in spirituous liquids is estimated by observing their specific gravity; but as they usually contain other substances besides water, they must be distilled before a determination can be made. Alcohol in its various forms, especially if taken habitually, is highly injurious to health. While it promotes very powerfully the secretion of the gastric juice, it sets up inflammation of the gastric walls and gradually produces chronic dyspepsia. (See ALCOHOL, PHARMACOLOGY, etc.). The effects of chronic

alcohol poisoning are described in the article ALCOHOLISM (q.v.).

Alcohol cannot be entirely freed from water by distillation. Anhydrous or absolute alcohol may be prepared by boiling strong commercial alcohol with unslaked lime until a small sample is turned yellow by barium oxide; to remove the last traces of water the alcohol thus obtained may be further treated with anhydrous copper sulphate and finally distilled over a small quantity of metallic calcium. It must, however, be remembered that drying with metallic calcium introduces into the alcohol a small amount of ammonia, derived from the nitrogen usually present in calcium in the form of calcium nitride. The presence of traces of water may be readily detected by the use of dehydrated copper sulphate, which remains white only in perfectly anhydrous alcohol. Absolute alcohol acts as a deadly poison. It is a colorless liquid of specific gravity 0.8062 at 0°; it boils at 78° and solidifies at about 130° below zero C. It is extremely hygroscopic and mixes in all proportions with water, ether, chloroform, carbon disulphide, and many other liquids. It is also an excellent solvent for many substances, such as oils, gums, resins, and a number of inorganic compounds, and is thus largely employed in the preparation of tinctures, varnishes, dyes, perfumes, etc. The presence of alcohol in aqueous solutions is best detected by the so-called iodoform reaction: small quantities of iodine and of caustic potash almost immediately produce in the presence of alcohol a precipitate of iodoform, which may be readily recognized by its odor. In this manner it has been demonstrated that minute quantities of alcohol are present in the soil, in water and in the atmosphere. Small quantities of alcohol have likewise been found in the urine in diabetes. When acted on by an excess of dry chlorine gas, alcohol is transformed into chloral, from which, by the action of alkali, very pure chloroform may be obtained; chloroform may also be prepared from alcohol directly by the action of bleaching powder (chloride of lime). When warmed with concentrated sulphuric acid, alcohol yields ordinary ether. Alcohol is thus extensively employed in the manufacture of chloral, chloroform, and ether.

During the Middle Ages aqueous alcohol was prepared by the distillation of fermented material. Anhydrous alcohol was prepared first by Lowitz in 1796, and its composition was determined first by Saussure in 1808. See FUEL; METHYLATED SPIRIT.

Consult: Stevenson, *A Treatise on Alcohol, with Tables of Specific Gravities* (London, 1888); Maercker, *Handbuch der Spiritusfabrikation* (Berlin, 1889; French trans., 2 vols., Lille, 1889); Roux's series of seven books on the manufacture of alcoholic beverages, published under the general title *La fabrication de l'alcool* (Paris, 1885-92); Brachvogel, *Industrial Alcohol: Its Manufacture and Uses* (New York, 1907); Herrick, *Denatured or Industrial Alcohol* (New York, 1907); Wright, *Handbook on the Distillation of Alcohol from Farm Products* (New York, 1907); and *Brenneri-Lexicon*, edited by Delbrück (Berlin, 1912 ff.).

ALCOHOL, PHARMACOLOGY (PHARMACODYNAMICS), TOXICOLOGY, AND THERAPEUTIC USE. Ethyl, or grain alcohol (C₂H₅OH) is the only one of the lower alcohols found in the tissues and body fluids under normal conditions. Ac-

According to recent investigations (Schweissheimer) normal human blood contains, especially after digestion, from 0.003 to 0.004 per cent of alcohol.

Alcohol is used, in one form or other, as a beverage, a drug, and as an external application. Its value depends upon three factors, viz., (a) its local irritant action, (b) its effect on the central nervous system, and (c) its use as a food. When alcohol is applied to the skin in concentrations varying from 60 to 90 per cent, it produces a reddening (flushing) of the skin, and a feeling of heat which is due to a dilatation of the blood vessels and consequent increased flow of blood to the part. When the alcohol begins to evaporate, a sensation of cold is experienced. If applied in concentrated form to a mucous membrane or open wound, it produces pain and a whitening of the tissue at the point of application; this on closer examination will be found to be a coagulum of the tissue protein.

The actual value of alcohol as a beverage cannot be discussed apart from its value as a food, although it is usually imbibed solely for its refreshing and stimulating effect. The rôle played by alcohol on the digestive function has been the subject of many discussions. The belief prevails, especially amongst the laity, that taken in small amounts it will create an appetite and stimulate digestion. It has been found, however, that very small amounts of alcohol do not affect, or stimulate only slightly, the digestive power of ferments outside of the body. It has been further noted that alcohol in a dilution of 5 to 10 per cent diminishes the rate of digestion itself. The pancreatic function is affected by even smaller amounts. Alcohol, when placed in the mouth in a sufficiently dilute form, will stimulate the flow of saliva, but this is considered a reflex act. Acting as an irritant directly on the stomach wall, it accelerates the secretion of gastric juice. According to Chittenden and Mendel, this increased secretion of gastric juice will also occur if the alcohol is introduced in the intestine.

The effect of alcohol on the amount of digestion still remains a matter for dispute. Some (Chittenden, Mendel, and Jackson) assert that the retarding effect of alcohol on digestion is compensated by the increased flow of gastric juice. Others (Kretschy and Buchner) argue that protein digestion is distinctly retarded by alcohol or even beer, which contains only a little alcohol. Eichenberg and Wolffhardt think that alcohol or wine stimulates the digestion, and Gluzinsky states that alcohol, when present in the stomach, inhibits digestion, but that after it is resorbed digestion proceeds at a better rate than when no alcohol had been present. Zuntz and Magnus-Levy conclude that, when beer is taken with the dietary, absorption and utilization of the food by the tissues are not favored. On the other hand, Atwater and Benedict found that alcohol, when given in moderate amounts, appears to increase very slightly the availability of the nutrients in the diet, but more especially the protein. They point out, however, that in view of the fact that there are often marked differences in the availability of the same kind of diet with different persons and with the same persons at different times, this conclusion must be held with a degree of reserve.

At one time it was supposed that alcohol on

absorption by the digestive tract was not utilized by the body, but was eliminated by the skin, lungs, and kidneys in an unchanged state. The experiments of Atwater and Benedict showed, however, that 98 per cent of the alcohol ingested was utilized in the human organism when the subjects received 2½ ounces of alcohol per day, or about as much as would be taken in a bottle of claret, 6 ounces of whisky, or 5 ounces of brandy. It was further noted that a pound of alcohol would furnish as much energy as 1.73 pounds of carbohydrates (starches, sugars, etc.), or 0.78 pounds of fats. It can, therefore, be inferred that alcohol, when utilized by the body, must either produce tissue itself or undergo oxidation and spare some tissue which would otherwise be oxidized for heat and energy production. That alcohol does cause fats and carbohydrates to be spared is to-day an established fact, and the evidence thus far gathered, although not conclusive, makes us almost believe that it will spare the main tissue substance, protein, also, although according to Neumann the body must first become accustomed to alcohol before it can spare protein. The sparing power of alcohol explains in part why some users of alcohol become fat, although in the case of beer-drinkers the solid materials may have some nutritive value. In any case, however, alcohol can never substitute as a regular thing for any great part of the nutrients in the dietary.

The continuous temperate use of alcohol produces a certain degree of tolerance—an immunity as it were—in many subjects; others are hypersusceptible and cannot stand it at all. As some seem to tolerate large doses without any untoward effects, it is obvious that tolerance is entirely dependent upon the quality of the cellular make-up of the individual taking alcohol. Alcohol has a direct toxic effect upon the cells it comes in contact with, and local damage is directly relative to the amount of alcohol present.

The absorption of alcohol is most rapid when the digestive tract is comparatively empty. This explains why the ill effects of alcohol are less apparent when food is eaten at the same time or shortly after taking the alcohol; it is a notable fact that some foods by virtue of their nature delay the absorption of alcohol. Alcohol when taken by way of the mouth goes over into the blood, and the largest amount of alcohol is present in the blood of intoxicated persons.

The principal action of alcohol is on the central nervous system, but it also acts on the spinal cord. Binz and his followers believe that it first stimulates and then depresses, while Schmiedeberg and adherents think that alcohol depresses the central nervous system from the outset. In the first, or excitement, stage alcohol influences the heart beat, the blood pressure rises, an ephemeral but deceptive feeling of warmth is experienced, and there seems to be an increased faculty of motion and speech. Whether this first stage is actually due to the stimulating action of the drug is still a matter of dispute. It has been suggested, however, that it is due to some action on the peripheral nerves, or possibly to the utilization of the alcohol as a food by the muscle tissue. Alcohol does not increase the capacity for mental or physical work; its use practically always causes a dulling of judgment. Kraepelin, of Munich,

who probably has done the most work on the psychological effects of alcohol, is of the opinion that the receptive and intellectual powers are weakened by very small quantities of alcohol, while motor function is increased by very small quantities and retarded by large quantities. Typesetters have been found to make fewer errors and do more work when not using it.

In the narcotic stage there is a generally lowered psychic activity, sensation and motion are lessened, the speech is muttering and thick, the senses are blunted, the gait staggering, and finally there is a tendency to sleep. When unconsciousness is established, there is anæsthesia. In the paralytic stage, i.e., beginning of medullary paralysis, the breathing is slow, intermittent, and stertorous, the pupils are dilated, the pulse is hardly perceptible, the reflexes are abolished, and the skin is cold.

While immediate death is rare from acute alcohol poisoning, many fatalities occur as a result of losing consciousness. In such cases vomitus may be sucked into the air tubes (trachea, etc.), or the subject may fall face downward into water or mud and become suffocated. In winter intoxicated persons often freeze to death. The minimum fatal dose of alcohol is not exactly known; some give it as between 60 and 180 grams (about 2-6 ounces by weight). In Maschka's cases a girl of five and a boy of nine died after the forced administration of about 1.6 oz. of absolute alcohol.

The recovery from alcohol poisoning is slow, and coma is replaced by natural sleep. On awakening the symptoms of an acute gastrointestinal catarrh (since the stomach, etc. are in an irritable condition) and possibly a neuritis are noted. There are present a coated tongue, foul breath, loss of appetite, vomiting—especially when food is taken—and headache.

By long and injudicious use, alcohol affects all tissues with which it comes in contact. It acts as a stimulator of cell growth, often in undesirable places, as in the liver, kidneys, etc.; it is entirely or in part responsible for many human ills as cirrhosis of the liver (hobnail liver, etc.), nephritis (kidney disease), diabetes, gout, hardening of the arteries (arteriosclerosis), gastritis, insanity, etc. Alcoholics are very susceptible to infectious diseases in general, especially pneumonia and tuberculosis.

Alcohol, when habitually used by parents, has undoubtedly untoward effects on the progeny, as is shown by a vast amount of statistical data. Experimentally, Stockard has shown with guinea pigs that alcohol had a distinct effect on the development of the embryo. The statistics gathered in Paris in the service of Bourneville showed that of 3271 children of impaired mental condition 1156 had alcoholic fathers, 100 alcoholic mothers, and 53 had both alcoholic fathers and mothers; in 538 cases no data were obtainable, and in the remainder the parents were temperate.

Even from what has been said against alcohol, it is not altogether sure that its use as a medicine can be dispensed with. In pharmacy and medicine it finds extensive use as a solvent for drugs, and for preparing fluid and solid extracts and tinctures of drug plants, for essential oils, alkaloids, etc. As a remedy it is valuable in shock, collapse, and syncope, in fever, in conjunction with other drugs for snake bite, locally as an antiseptic, anodyne, stimulant,

and dressing for wounds, for hardening the cuticle when bed sores are threatened, as a cooling lotion, etc. It must not be assumed, however, that alcohol is good in all diseases, for we know to-day that for most epileptics it is decidedly detrimental.

Consult: W. O. Atwater et al., "An Experimental Inquiry Regarding the Nutritive Value of Alcohol," *Memoirs National Academy of Sciences*, viii (1902); (U. S. Senate, 57 Cong., 1 Sess., Doc. 233); J. S. Billings et al., *Physiological Aspects of the Liquor Problem* (Boston and New York, 1903); Cushny's *Pharmacology* (Philadelphia, 1901); Sollman's *Pharmacology* (Philadelphia, 1908); *Journals American Medical Association*; F. Hare, *Alcoholism: Its Clinical Aspect and Treatment* (Philadelphia, 1913); Rosenfeld's *Der Einfluss des Alkohols auf den Organismus* (Wiesbaden, 1901); W. Schweisheimer, "Der Alkoholgehalt des Blutes unter verschiedenen Bedingungen," in *Deut. Arch. Klin. Med.*, cix, Nos. 3-4.

ALCOHOLISM. The term employed to denote the symptoms of disease produced by alcoholic poisoning. In acute alcoholism, which is generally caused by the rapid absorption of a large quantity of alcoholic drinks, the first symptoms are animation of manner, exaltation of spirits, and relaxation of judgment. The emotions are altered and often perverted; muscular movements become irregular or ataxic; the mechanism of speech suffers. The further development of the symptoms presents a variety of effects. In the ordinary course of the action of the drug, dizziness, disturbance of sight and hearing, and other troubles due to disorder of the central nervous system, ensue, leading to heavy sleep or profound coma, from which it is sometimes impossible to rouse the individual, who lies completely paralyzed, breathing stertorously. Sometimes the alcohol affects so strongly the centres of respiration and circulation that death is caused by paralysis of one or other, or both. This condition of coma requires to be carefully distinguished from opium poisoning. In the former, the face is usually flushed and the pupils dilated, while in the latter the face is pale and the pupils contracted. The odor of the breath is no criterion, inasmuch as sympathizing bystanders are apt to administer spirits in every case of depression, often with hurtful effects. Fracture of the skull, delirium of meningitis, and coma after epilepsy or after cerebral hemorrhage are often undiscovered by the inefficient ambulance surgeon, who is led to diagnose a condition from an alcoholic breath. A second class of alcoholics act in an entirely different manner. Instead of sinking into stupor or coma, the individual becomes more and more excited, bursts into wild mirth or passionate anger, struggles violently with those who attempt to soothe him, and may grievously harm himself or others. This is the condition known as alcoholic mania—the physical explanation of many fearful crimes. It is more apt to follow a somewhat protracted debauch. After a longer or shorter period of fierce excitement, it is in most cases succeeded by great depression, and sometimes during this condition there may be sudden death from failure of the respiration or circulation. In some patients, the stage of excitement culminates in a convulsive seizure. The convulsions are repeated at intervals, are very complicated in character, and produce remarkable contortions of the body. These usually

grow less violent and, passing off, end in deep sleep; but here also death may occur from the action of the poison. Such cases of "alcoholic epilepsy" are comparatively rare and occur principally in acute exacerbations of chronic alcoholism. Acute alcoholism is more apt to occur in those who are of unsound mind and weak nervous system, and this applies especially to the two last-described forms of the affection. In the treatment of acute alcoholism it is always wise to wash out the stomach, in case alcohol is present, or to accomplish much the same object by free vomiting and purgation. In the profound coma the administration of stimulants, such as ammonia and strychnine, may be called for, and sometimes artificial respiration may be the only means of saving life. In the maniacal and convulsive forms of the affection, sedatives must be used. After the immediate symptoms have passed away in all forms, the individual must be carefully fed with nutrient enemata, on account of the disturbance of the digestive system, along with remedies which will subdue the digestive irritation and overcome the depression of the nervous system.

Chronic alcoholism is caused by the prolonged use of overdoses of various alcoholic drinks. Changes (see ALCOHOL, PHARMACOLOGY, etc.) are caused in every tissue of the body, but the nervous, respiratory, and circulatory systems are more especially affected, together with the liver and kidneys. There is always more or less catarrh of the digestive organs, shown by dyspepsia, heart-burn, vomiting—especially in the morning—and usually diarrhœa. The liver becomes enlarged from congestion, and may afterward shrink, pressing on the veins and bringing back blood to the heart from the abdominal viscera, leading to congestion of the bowels, hemorrhoids, and hemorrhages. From changes in the organs of circulation there is a tendency to palpitation, fainting, and breathlessness on exertion. These alterations are degenerations of the heart, which may be soft or even fatty; fibrous changes in the walls of the arteries; and dilatation of the capillaries from paralysis of the vaso-motor nerves. This last condition gives the florid complexion and mottled appearance to chronic drinkers. There is, besides, usually some congestion of the kidneys; but it is erroneous to attribute Bright's disease mainly to alcohol. The lungs are subject to chronic congestion and catarrh of the bronchial tubes and lung tissues. The muscular system suffers, the muscles becoming flabby and fatty. There is a great tendency to deposition of fat, and skin diseases are frequently induced by the vaso-motor changes.

Two characteristic results of the action of the drug on the central nervous structures are delirium tremens and alcoholic insanity. (See INSANITY.) In treating chronic alcoholism the great point is to prevent the employment of alcohol in any form and to invigorate the bodily and mental functions. See DELIRIUM.

Social scientists agree that alcoholism presents one of the most serious of modern social problems. The chief sociological effects of alcoholism are connected with increased morbidity and mortality, industrial accidents, pauperism, crime, insanity, and degeneracy in offspring. The statistical treatment of such effects is at present extremely unsatisfactory. The difficulties inherent in the collection and interpretation of such statistics are complicated by the par-

tisanship of opponents or supporters of the traffic in alcoholic liquors.

With respect to mortality, the evidence of life insurance companies is fairly trustworthy. Statistics were published in 1910 giving the experience of the Leipzig Ortskrankenkasse with respect to about 1,125,000 insured in the period 1887-1905. Of these 4847 were classed as "alcoholics," having been treated at some time during the period for delirium, etc. The mortality of the alcoholics was about three times the average for the same age groups. With this may be compared an investigation undertaken by a British actuary, Mr. F. G. P. Neison, in 1850, dealing with the mortality of a group of a little over 6000 heavy drinkers. Placing the general mortality of England and Wales at 100, the mortality of this group was 325.

Such figures do not, of course, show the net death rate due to alcohol, since it is impossible to determine in how large a proportion of the cases alcoholism is a result rather than a cause of a constitutional weakness that would naturally increase mortality. More satisfactory evidence is afforded by the statistics of mortality in the occupations in which the temptation to drink is especially strong, such as brewing, retail dealing in alcoholic beverages, innkeeping. There is no reason for assuming a higher proportion of constitutional defectives in these industries than in the general population. According to the experience of the Gotha Life Insurance Company, the excess of mortality of brewery workers over that of the general population is 62 per cent, tapsters, 55 per cent, innkeepers, 47 per cent.

Since persons known to be heavy drinkers are generally rejected by insurance companies, information relating to mortality among them is meagre. Some life insurance companies distinguish carefully between total abstainers and moderate drinkers. The latter invariably show a heavier death rate than the former. The most striking figures that have been published by any company are those of the United Kingdom Temperance and Provident Institution. The records cover the period 1866-1905 and show that mortality among total abstainers amounts to 71.54 per cent of the calculated probabilities, as compared with 94 per cent for the moderate drinkers.

There are no trustworthy statistics of the total number of deaths in any country due to alcoholism. In 1883 a report was published by the Harveian Society of London, analyzing the data for 10,000 deaths. The reporters came to the conclusion that alcohol had played some part in causation in 14 per cent of the cases. Assuming that the figures, which were for London, would apply to the country as a whole, it was estimated that the mortality from alcohol in England and Wales would amount to nearly 40,000 annually. An American actuary, Mr. E. B. Phelps, working on the basis of the published statistics of the registration area, calculated the alcoholic mortality in the United States at 7.7 per cent of the whole mortality, or practically 66,000.

A considerable body of statistics on the relation between alcoholism and sickness is being collected in European countries which practice invalidity insurance. The available statistics indicate that, measured in number of days ill, the morbidity of those described as alcoholic is about twice that of the general population.

The tuberculosis morbidity rate is especially heavy among workers in the alcoholic trades, being inferior only to the rate among stone cutters, metal polishers, and printers.

The connection between alcoholism and accidents is generally recognized, but trustworthy statistics bearing upon it are rare. In Prussia, 1869-73, of 33,321 fatal accidents, 4.66 per cent were assignable to drunkenness. In Saxony, of 17,939 fatal accidents in the period 1847-76, 6.2 per cent were due to drunkenness. In England, 1877-81, of 87,458 persons fatally injured, 9.2 per cent were either intoxicated or suffering from delirium tremens. These are, of course, minimum figures, as in many cases all evidence as to the state of the person injured is destroyed by the accident.

Indirect evidence of the relation of alcoholism to industrial accident is given by the distribution of accidents through the week. It is a well-known fact that drinking is most common, among industrial laborers, on Saturday evening and Sunday. An investigation of accidents in the building trades showed that of 3972 accidents 19.9 per cent occurred on Monday, while the next highest percentage was 16.5 per cent. Of 25,295 accidents in the Berlin building trades, 1885-98, 18.7 per cent occurred on Monday, the next highest percentage being 16.6. The same fact is brought out by analysis of the accident statistics of other cities.

There is no agreement as to the relative amount of pauperism due to alcoholism. The Committee of Fifty, which made a careful study of the social aspects of the liquor problem in the United States, assigns 33 per cent of pauperism to the personal use of alcohol, 8.7 per cent to its use by others. British estimates place the percentage of pauperism due to alcoholism at from 20 to 50 per cent. German estimates are far lower—10 to 20 per cent. No estimates of the kind have much scientific value. It is impossible to determine in many cases how far alcoholism is a cause of pauperism, how far merely a concurrent effect of an original moral and physical weakness.

The relation between insanity and alcoholism is close, but here again statistics furnish no clue to the determination of cause and effect. In the asylum population of England and Wales, 17,000 out of 116,000 have alcoholic histories. One-third of the lunatics of New York have been alcoholics. Statistics of the insane in Vienna (1895-96) disclose an alcoholic history in the case of 40 per cent. Prussian statistics for 1888 indicate a connection between alcoholism and insanity in 40 per cent of the cases treated in asylums. The records of the Asylum of St. Anne in Paris indicate an alcoholic history for 51 per cent of the men and 22 per cent of the women.

The relation between alcoholism and crime is still closer. The Committee of Fifty scrutinized the records of 13,402 convicts in 17 American prisons and found that 49.95 per cent had alcoholic histories. In an investigation of Sing Sing and Auburn prisons it was found that, of those who had committed crimes against the person, 40.47 per cent were habitual drunkards. In England prisoners convicted of grave homicidal offenses show an alcoholic percentage of 60. An investigation of the records of 32,837 prisoners in the jails and prisons of the German Empire showed alcoholic histories in the case of 46.1 per cent of the murders, 63.2 per

cent of the homicides, 74.4 per cent of homicidal assaults, and 62 per cent of milder assaults. An investigation of convicts in Vienna showed that 58.8 per cent were victims of alcoholism; a similar investigation in Paris showed that 68.6 per cent of the prisoners at the St. Pélagie were alcoholic.

There appears to be strong evidence in support of the view that alcoholism is a factor in producing degeneracy in offspring. Direct experiments carried on with dogs and guinea pigs have established beyond question that excessive amounts of alcohol reduce markedly the number of live offspring as well as the viability of those born living. An excessive proportion of the offspring are physically defective. The taint may be conveyed by either parent. The human race, it would appear, is more nearly immunized to alcohol, and the transmission of physical taint through alcoholism is not so certainly established. None the less there is no lack of statistics indicating some relation between alcoholism and congenital defects. Figures for epileptics at the Craig Colony in New York indicate that over 20 per cent of the inmates are the offspring of alcoholic parents. Bourneville found that of 2552 mentally defective children in the institution at Bicêtre, France, 41 per cent had alcoholic parents. Detailed studies of family histories have brought out the fact that congenital defects may be related to alcoholism in grandparents, where the parents themselves were not alcoholic. On this ground many social scientists believe that the figures given above greatly understate the part played by alcoholism in producing such defects.

Bibliography. The Committee of Fifty has made the best study of the subject in its volume on *Economic Aspects of the Liquor Problem* (Boston, 1899). Consult also: "The Relations of the Liquor Traffic to Pauperism, Crime, and Insanity," *Twenty-sixth Annual Report of the Massachusetts Bureau of Labor Statistics* (Boston, 1895); "Economic Aspects of the Liquor Problem," *Twelfth Annual Report of the United States Department of Labor* (Washington, 1898); Hoppe, H., *Die Tatsachen über den Alkohol* (Berlin, 1901); Kelynack, T. N., *The Drink Problem* (New York, 1907); Williams, H. S., *Alcohol* (New York, 1909); Phelps, E. B., *The Mortality of Alcohol* (New York, 1911). See TEMPERANCE; PAUPERISM; CRIME.

AL'COHOLOM'ETRY (*alcohol* + Gk. μέτρον, *metron*, *measure*). A name applied to any process of estimating the percentage of absolute alcohol in a sample of spirits. Certain chemical methods have been tried for the purpose, but the one usually employed consists in determining the specific gravity of the spirit. As liquors, however, generally contain other substances besides water, they must be carefully distilled before a determination can be made. Every mixture of alcohol and water has a specific gravity of its own, which depends (1) on the relative composition of the mixture, and (2) on the temperature; once the specific gravities of various mixtures have been determined, the composition of a sample can be ascertained by determining its specific gravity and observing the temperature. The following table shows the specific gravities of mixtures of alcohol and water, containing 5, 10, 15, 20, etc., per cent by weight of alcohol, at the temperatures 0°, 10°, 20° and 30° C.:

Percentage by weight of alcohol.	0°	10°	20°	30°
5	0.99135	0.99113	0.98945	0.98680
10	0.98493	0.98409	0.98195	0.97892
15	0.97995	0.97816	0.97527	0.97142
20	0.97566	0.97263	0.96877	0.96413
25	0.97115	0.96672	0.96185	0.95628
30	0.96540	0.95998	0.95403	0.94751
35	0.95784	0.95174	0.94514	0.93813
40	0.94939	0.94255	0.93511	0.92787
45	0.93977	0.93254	0.92493	0.91710
50	0.92940	0.92182	0.91400	0.90577
55	0.91848	0.91074	0.90275	0.89456
60	0.90742	0.89944	0.89129	0.88304
65	0.89595	0.88790	0.87961	0.87125
70	0.88420	0.87613	0.86781	0.85925
75	0.87245	0.86427	0.85580	0.84719
80	0.86035	0.85215	0.84366	0.83483
85	0.84789	0.83967	0.83115	0.82232
90	0.83482	0.82665	0.81801	0.80918
95	0.82119	0.82291	0.80433	0.79553
100	0.80625	0.79788	0.78945	0.78096

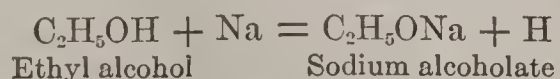
See also article HYDROMETER.

ALCOHOLS. A name applied in organic chemistry to one of the largest and most important classes of carbon compounds. The alcohols possess in common certain chemical properties, though they are otherwise very different from one another. They all contain one or more hydroxyl groups (OH) linked directly to some fatty hydrocarbon group (such as methyl, CH₃, ethyl, C₂H₅, etc.), and are subdivided both with reference to the number of their hydroxyl groups and with reference to the nature of their hydrocarbon groups. When the alcohols are acted on by the chlorides or bromides of phosphorus, chlorine or bromine takes the place of their hydroxyl groups, and as a result, halogen derivatives of the corresponding hydrocarbons are produced. Thus, by the action of phosphorus pentachloride, ethyl alcohol may be transformed into ethyl chloride (mono-chloro-ethane), according to the following chemical equation:

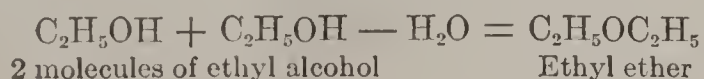


With reference to the number of their hydroxyl groups, the alcohols are divided into *mono-hydric*, *di-hydric*, *tri-hydric*, etc. According to the nature of the radicle to which these groups are attached, alcohols may be *saturated* or *unsaturated*, *fatty* or *aromatic*. With reference to their chemical constitution and behavior toward oxidizing agents, alcohols are further divided into *primary*, *secondary*, and *tertiary*. The primary alcohols are characterized by the uni-valent group CH₂OH; the secondary, by the di-valent group CHOH; the tertiary by the tri-valent group COH. The differences in their reactions are described below.

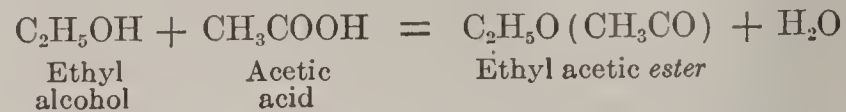
The hydrogen of the hydroxyl group of an alcohol can be replaced by metals or by hydrocarbon radicles or by acid radicles. In the first of these cases a metallic *alcoholate* is obtained; in the second case, an *ether*; in the third case, an *ester*. Thus, by the action of metallic sodium on ordinary (ethyl) alcohol, sodium alcoholate is obtained, according to the following chemical equation:



On the other hand, by dehydrating ethyl alcohol, ordinary ether is obtained, as follows:



In this transformation (usually effected by the dehydrating action of sulphuric acid), the ethyl group of one molecule of alcohol evidently takes the place of the hydroxyl hydrogen of another molecule. Finally, the action of an organic acid replaces the hydroxyl hydrogen of an alcohol by an acid radicle. For instance:

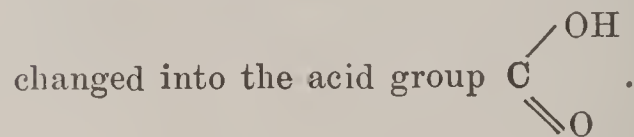


The chemical transformations characterizing the three sub-classes of the alcohols, viz., the primary, secondary, and tertiary alcohols, are as follows:

1. It was mentioned above that primary alcohols contain the group CH₂OH. When they are oxidized, this group is changed into the group



another important class of organic compounds. By further combination with oxygen aldehydes readily yield acids, the group CHO being ex-



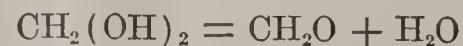
2. When secondary alcohols are oxidized, their characteristic group CHOH is converted into the group CO, and as a result *ketones* are produced.

3. Tertiary alcohols cannot be transformed by simple oxidation into a compound whose molecule contains the same number of carbon atoms.

The three sub-classes of alcohols can thus be readily distinguished from one another by their behavior toward oxidizing agents.

Primary alcohols may be transformed into corresponding secondary or tertiary alcohols with the aid of sulphuric acid. Thus, by dehydration with sulphuric acid normal propyl alcohol, C₂H₅CH₂OH (primary), is converted into propylene, CH₃CH:CH₂; but when this is re-hydrated by dissolving in fuming sulphuric acid and boiling with water, *iso-propyl* alcohol, (CH₃)₂CHOH (secondary), is obtained. In this manner a hydroxyl group can be made to change its position in the molecule by simple laboratory methods.

The di-hydric alcohols, as the name indicates, contain two hydroxyl groups. *Glycols* is the name usually applied by chemists to the di-hydric alcohols. The simplest glycol, derived from methane (CH₄)—the simplest hydrocarbon—should be represented by the formula CH₂(OH)₂. But though certain compounds of this glycol have been obtained, the glycol itself could not be prepared in the free state. Experience shows, in general, that the formation of a compound in which two hydroxyl groups might be attached to one carbon atom is almost invariably accompanied by a loss of the elements of water. The imaginary compound CH₂(OH)₂ is thus split up, according to the following equation:

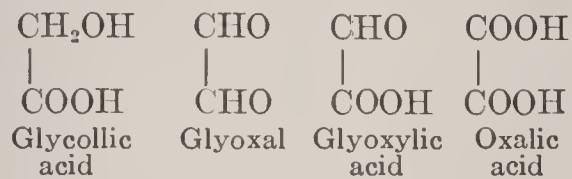


The compound CH₂O (formaldehyde) is therefore obtained in reactions which might be expected to result in the formation of the glycol CH₂(OH)₂. The simplest glycol actually pre-

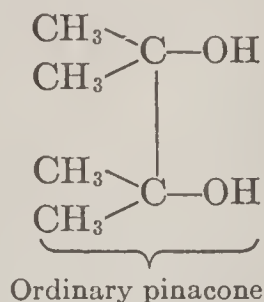
pared is a derivative of ethane (C_2H_6), one hydroxyl group being attached to each of the two carbon atoms of ethane, and its formula

therefore being $\begin{array}{c} CH_2OH \\ | \\ CH_2OH \end{array}$. This glycol evidently

contains two primary alcohol groups (CH_2OH), by the oxidation of one or both of which a series of interesting compounds is obtained, including:



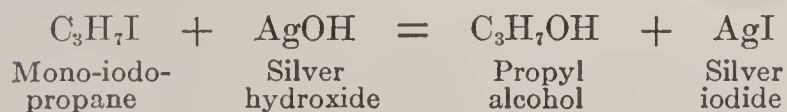
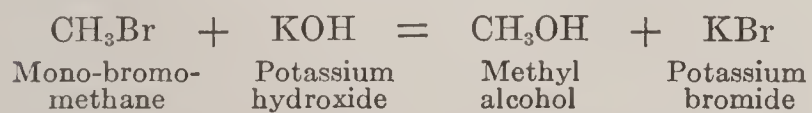
Glycols containing two tertiary-alcohol groups (COH) are usually called *pinacones*, the simplest pinacone known being represented by the following graphic formula:



The simplest and best-known tri-hydric alcohol is the well-known glycerin (q.v.). Among other poly-hydric alcohols may be mentioned the hexa-hydric alcohol *mannitol*, which is found in *manna* (q.v.). The poly-hydric alcohols generally possess a sweet taste and are insoluble in ether. A number of them occur ready-formed in nature.

The mono-hydric alcohols are rarely found in nature in the free state; in the form of esters, however, i.e., in combination with acids, they occur largely in the vegetable kingdom. The formation of alcohols from the sugars through fermentation is described elsewhere. (See ALCOHOL and FERMENTATION.) It remains to mention here a few of the general chemical methods by which alcohols are made artificially.

1. Many alcohols are prepared from the corresponding hydrocarbons by substituting halogens for part of their hydrogen, and treating the halogen derivatives thus obtained with dilute aqueous alkalis or with moist silver oxide. The following equations represent examples of the formation of alcohols from halogen-substitution products of hydrocarbons:

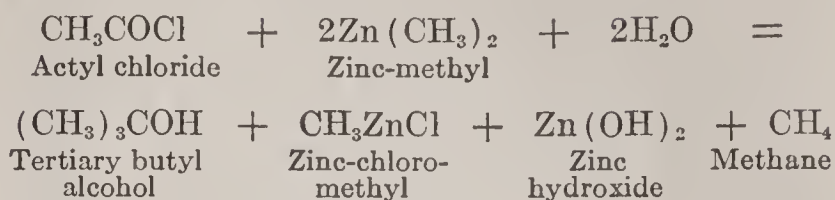


2. Since aldehydes are produced by the oxidation of primary alcohols, the latter may be obtained, conversely, by reducing aldehydes.

3. Since ketones are produced by the oxidation of secondary alcohols, the latter may, conversely, be prepared from ketones by reduction. Thus, secondary propyl alcohol may be obtained by the action of nascent hydrogen on acetone (dimethyl-ketone).

4. Tertiary alcohols may be prepared from chlorides of acid radicles with the aid of compounds of zinc with hydrocarbon radicles. Thus,

tertiary butyl alcohol is obtained according to the following equation:



The aromatic alcohols, i.e., alcohols whose molecules contain a benzene nucleus may be prepared by methods analogous to those just described. Aromatic alcohols must be distinguished from the phenols—a class of hydroxyl derivatives of the aromatic hydrocarbons—which are in many respects quite different from the alcohols. See PHENOLS.

A variety of alcohols may now be best prepared by the Grignard reaction, a general method by which innumerable syntheses have been carried out in recent years. See GRIGNARD REACTION.

ALCOLEA, ä'l'kô-lä'ä, BRIDGE OF. A bridge across the river Guadalquivir, 8 miles northeast of Cordova, Spain, the scene of a battle Sept. 28, 1868, between the revolutionary troops of Serrano and those of Queen Isabella. The latter were beaten, and the Queen, dethroned, fled to France.

ALCORAN, ä'l'kô-rän or ä'l'kô-rän'. See KORAN.

ALCORN, ä'l'körn, JAMES LUSK (1816-94). An American statesman, born in Golconda, Ill. He was educated at Cumberland College, Ky., and became a lawyer in that State and sat in its Legislature. He went to Mississippi in 1844 and served in the State Legislature from 1846 to 1865, when he was elected United States Senator, but was not then permitted to take his seat. In 1861 he had been a member of the secession convention. He was elected Governor on the Republican ticket in 1869, but resigned two years later to enter the United States Senate, where he continued until 1877. In 1873 he was defeated for Governor on an independent ticket. He was the founder of the levee system of Mississippi, and became president of the Levee Board of the Mississippi-Yazoo Delta. Four years before his death he was a member of the State Constitutional Convention. A Mississippi agricultural and mechanical college for colored students which he was instrumental in establishing was named in his memory. Further proof of his interest in the negro race is found in his *Civil Rights* speech, published by the Government Printing Office in 1874.

ALCOTT, ä'l'küt, AMOS BRONSON (1799-1888). An American educational reformer, conversationalist, and Transcendental philosopher. He was born at Wolcott, Conn., Nov. 29, 1799, and died in Boston, March 4, 1888. He was the son of a farmer, and his first experience of life was gained as a peddler in the South. In 1828 he became an educational reformer and established in Boston a school in which he attracted much attention by the novelty of his methods. Of this there is an account by Elizabeth Peabody (*A Record of Mr. Alcott's School*, 1834; 3d ed., 1874). His method was largely conversational, and a transcript of his talks appeared in 1836 as *Conversations with Children on the Gospels*. Ways that would now seem more commendable than noteworthy then met with bitter denunciation, so that Alcott abandoned his school, moved to Concord, and

sought to disseminate his views on theology, education, society, civics, and vegetarianism through lectures, winning attention by his originality and sometimes graceful though often rambling speech. In 1842 he visited England and returned with two friends, one of whom bought an estate near Harvard, Mass., where they endeavored to found a community, "Fruitlands," which speedily failed. Alcott then went to Boston and later to Concord, leading the life of a peripatetic philosopher and giving "conversations," which found increasing favor, especially in the West. In later years his manner became more formal and his always nebulous teaching apparently more orthodox. Besides frequent contributions of "Orphic Sayings" to the Transcendental organ, *The Dial*, he published fragments from his voluminous diary, *Tablets* (1868); *Concord Days* (1872); *Table Talk* (1877); *Sonnets and Canzonets* (1877), and also *New Connecticut* (1881), and an *Essay on Ralph Waldo Emerson: His Character and Genius* (1882). For his biography, consult Sanborn and Harris, *Life* (2 vols., Boston, 1893); also Lowell's contemporary criticism, in *A Fable for Critics* (New York, 1848), and "A Study from Two Heads," in the *Poems*.

ALCOTT, LOUISA MAY (1832-88). An American novelist and juvenile writer. She was born at Germantown, Pa., Nov. 29, 1832, and died at Boston, March 6, 1888. She began her active life as a teacher, writing stories of harmless sensation for weekly journals and publishing the insignificant *Flower Fables* (1855). During the Civil War she volunteered as an army nurse and wrote for a newspaper the letters afterward collected as *Hospital Sketches* (1863). She first attracted notice by *Little Women* (1868; second part, 1869), the best and most popular of her writings, in which she drew herself in the character of Jo. Among the more noteworthy of numerous other contributions to the literature of adolescence are: *An Old-Fashioned Girl* (1869), *Little Men* (1871), and *Jo's Boys* (1886). Her novels, *Moods* (1863) and *Work* (1873), attracted little attention. In later years she suffered much from ill-health; but her writing was to the last singularly buoyant and hopeful, full of faith in human nature, democracy, and freedom. She was typical in her social ethics of the literary generation in which her father, Amos Bronson Alcott (q.v.), had been a prominent figure. There is a *Life*, by Cheney (Boston, 1889), which is more frankly written than most biographies, and one by Belle Moses (New York and London, 1909), under the title *Louisa May Alcott, Dreamer and Worker*.

ALCOTT, MAY (1840-79). An American artist, daughter of Amos Bronson Alcott and wife of Ernest Nieriker. She was born at Concord, Mass., and studied at the Boston School of Design and in Paris. She showed considerable skill in still-life subjects, particularly in flowers and sketches of nature, but attained her greatest success by her oil and water-color copies of the paintings of Turner, which were highly praised by Mr. Ruskin and were given to the pupils of the South Kensington schools, London, to work from. Mrs. Nieriker was the author of *Concord Sketches* (Boston, 1869) and of *Studying Art Abroad* (1879).

AL'COVE. In architecture a recess opening from a larger room or inclosure, usually in order to serve some special function. Among

special forms of the alcove may be mentioned the bay-windows of modern houses; the apses (see APSE) of Roman basilicas and Christian churches, and the *trielinia* and *alæ* of the typical ancient Roman house, the former surviving to our time in the dining alcoves of many Syrian houses. In France, at least in Brittany, the bedstead is built into an alcove, and in some French châteaux and palaces the royal bedstead was set in an elaborately decorated alcove hung with tapestries and divided from the main bed-chamber by a carved balustrade (Chamber of Henry IV in the Louvre; of Louis XIV at Versailles). Business offices are sometimes arranged with alcoves for special functionaries or clerks, and certain libraries are planned on the alcove system, a part or the whole of one or both sides of a main reading- or book-room being set off into alcoves for special study or for particular classes of books. A similar arrangement is often employed in museums of art or science. See HOUSE; LIBRARY BUILDINGS.

ALCOY, ăl-kō'è. A town of Spain, in the province of Alicante. It is situated on the river Alcoy, 24 miles north-northwest of the city of Alicante (Map: Spain, E 3), and is one of the most busy and prosperous of Spanish towns. It is picturesquely placed on the slope of the Sierra Mariola, whose streams afford an abundance of water power. The public buildings include a consistory, town hall, poorhouse, and public granary. The city is the great centre of paper manufacture, and the mills are of considerable antiquity. The cigarette paper of Alcoy is especially well known in Spain. Sugar-plums (*peladillas de Alcoy*), woolen cloth, linen and cotton goods, as well as hardware, form other important branches of manufacture. Pop., 1910, 33,896. The prosperity of the place was interrupted for a time in 1873 by an insurrection of the Spanish Internationals, and the district is a centre for frequent communistic agitation.

ALCUDIA, ăl-kōō'dé-à, MANUEL DE GODOY. See GODOY, MANUEL, DUKE OF ALCUDIA.

ALCUIN, ăl'kwīn, or FLACCUS ALBINUS (c.735-804). The most distinguished scholar of the eighth century, the confidant and adviser of Charlemagne. He was born at York, was educated under the care of Archbishop Ecbert, and his relative Ælbert, and succeeded the latter as master of the school of York. Charlemagne became acquainted with him at Parma, as he was returning from Rome, whither he had gone to bring home the *pallium* for a friend. He invited Alcuin to his court and had his assistance in his endeavors to civilize his subjects. As a result of this association, Alcuin became the preceptor of the Emperor, whom he instructed in various subjects, especially rhetoric and dialectics. To render his instruction more available, Charlemagne established at his court a school called Schola Palatina, the superintendence of which, as well as of several monasteries, was committed to Alcuin. In the learned society of the court Alcuin went by the name of Flaccus Albinus. In 790 Alcuin returned to England, but was recalled by Charles in 794, who needed his aid at the Council of Frankfort. He again returned to York, but was forced by political changes to go back to France. He retired to the abbey of St. Martin, in Tours, in 796, and taking as his model the school of York, taught at Tours. While there he wrote frequently to the Emperor. He died May 19, 804.

He left, besides numerous theological writings, a number of works on philosophy, mathematics, rhetoric, and philology, as well as poems and a great number of letters. His letters, of which 311 are extant, while they betray the uncultivated character of the age generally, show Alcuin to have been the most accomplished man of his time. He understood Latin, Greek, and Hebrew. Editions of his works appeared in 1617 (Paris), 1777 (Ratisbon), and in Migne's *Patrologia*. Consult Mullinger, *Schools of Charles the Great* (London, 1877), West, *Alcuin and the Rise of Christian Schools* (New York, 1892), and Gaskoin, *Alcuin* (New York, 1904), and Page, *The Letters of Alcuin* (New York, 1911).

AL'CYONA'RIA (from Gk. ἀλκυόν[ε]ιον, *alkyon[e]ion*, bastard-sponge). A subclass of the Anthozoa, comprising a group of coral-polyps, characterized by the presence of eight



ALCYONARIA.

tentacles around the mouth and the division of the gastrovascular cavity into eight chambers. Typical forms, like the precious red corals, fall into the subordinate group Alcyonacea; the sea-fans constitute the group Gorgonacea; and the sea-pens the group Pennatulacea. See CORAL.

ALCY'ONE, āl-sī'ō-nē, or **HALCY'ONE** (Gk. Ἁλκυόνη, Ἁλκυόνη, *Alkyonē*, *Halcyonē*). In later Greek legend, the daughter of Æolus and wife of Ceyx, King of Trachis in Thessaly. According to one story, inconsolable on the death of her husband, she threw herself into the sea, whereupon she and her husband were changed into kingfishers as a reward of their mutual devotion. Alcyone was originally a sea divinity and appears in the legends of Bœotia, Argos, Megara, and elsewhere. The myth has been perpetuated in zoölogy by the name of a genus (*Alcyone*) of kingfishers; these birds are frequently called halcyons in poetic literature.

ALCYONE (Gk. Ἁλκυόνη, *Alkyonē*). The most brilliant of the "seven stars," or Pleiades. It is a star of the third magnitude and was supposed by Mädler to be the central sun, in reference to which our sun with its planets and all other known systems are moving, perhaps revolving within some almost incomprehensible period of time. It has been shown, however, that any central sun hypothesis is, as yet, far too daring, considering the insufficient state of our knowledge of sidereal systems and their motions. See PLEIADES.

ALDA, FRANCES (1884—). The stage name of a distinguished soprano. Her real name is Davis. She was born in New Zealand of Eng-

lish parents, but educated at Paris, where she was a pupil of Marchesi. She made her début at the Opéra Comique in Paris in 1904. In 1908 she became a member of the Metropolitan Opera House in New York. She won fame not only on the operatic stage, but also on the concert platform. In 1910 she was married to Giulio Gatti-Casazza, the director of the Metropolitan Opera House.

AL'DABEL'LA. 1. In Ariosto's *Orlando Furioso* (q.v.), the wife of Orlando, daughter of Monodantes and sister of Oliviero. In French and Spanish versions of the Orlando legends she appears as Alda and Auda. 2. In Dean Milman's tragedy of *Fazio* (q.v.), a fascinating but wicked woman, of whom Bianca, Fazio's wife, has cause for jealousy, and who is finally condemned to a nunnery.

ALDAN, āl-dän'. An affluent of the Lena, rising in the Siberian territory of Yakutsk, near the mountain ridge of Yablonov, in lat. 56° 31' N. and long. 123° 51' E. (Map: Asia, M 3). After flowing in a generally northerly direction for 1320 miles it empties into the Lena, 111 miles below Yakutsk. It is navigable for a distance of over 600 miles and abounds in sturgeon and sterlet.

ALDAN, āl-dän'. A mountain range on the left shore of the river that gives it its name, between 55° and 61° N. lat. (Map: Asia, M 3). It is a branch of the Stanovoi, about 400 miles long. The best-known summit, Kapitan, has an altitude of over 4000 feet.

ALDBOROUGH, āld'būr'ō, or, colloquially, ā'bro (AS. *ald*, old). An ancient village in the West Riding of Yorkshire, 16 miles west-northwest of York (Map: England, E 2). It is chiefly remarkable for its ancient ruins, as it was the Isurium of the Romans, and after York (*Eboracum*) the most considerable Roman camp north of the Humber. Remains of aqueducts, buildings, tessellated pavements, implements, urns, and coins have been found in great number. Pop., 1901, 439; 1911, 422.

ALDEB'ARAN (Ar. *al-dabarān*, the follower, i.e., of the Pleiades). The name of a brilliant red star of the first magnitude, in the constellation Taurus. It is the largest and most brilliant of a cluster of five which the Greeks called the Hyades and is situated a little to the southeast of the Pleiades. From its position in Taurus it is sometimes termed "the bull's eye." Its parallax, as determined by Elkin at New Haven, is 0".109, corresponding to a distance of 30 light-years.

ALDEGONDE, āl'de-gōnd', PHILIP VAN MARNIX, SAINT. See MARNIX, PHILIP VAN.

ALDEGREVER, āl'de-grā'vēr, HEINRICH (1502—c.1560). A German engraver and painter of the Renaissance, one of the foremost of the "Little Masters." He was born at Paderborn (Westphalia), the son of a burgher, but his real name, Trippenmeker, he discarded in adult life. The character of his art leads to the conclusion that he probably studied at Nuremberg, where he was influenced by the Beham brothers (q.v.) and by Penez (q.v.), not by Dürer, as is commonly supposed. He settled at and became a burgher of Soest, where he practiced his art. He was most distinguished as a line engraver. His earliest plates, like the "Standard Bearer" (1530), designed more directly under the Nuremberg influence, are the best. Of great merit also are the portrait busts of Luther and Melancthon after Crauch, and of the Anabap-

and alcohol. Thus, by the action of strong potassium hydroxide, benzaldehyde (q.v.) gives a mixture of benzoic acid and benzyl alcohol ($C_6H_5CH_2OH$).

ALDEN, ăl'den, BRADFORD R. (1800-70). An American soldier. He was born at Meadville, Pa., and in 1831 graduated at West Point, where he was an instructor from 1833 to 1840. He subsequently served for two years as aid to General Scott, and from 1845 to 1852 was commandant of cadets at West Point. In 1853 he organized and led an expedition against the Rogue River Indians, and in a fierce battle, fought near Jacksonville, Oreg., was so severely wounded that he was soon afterward forced to retire permanently from the army.

ALDEN, CYNTHIA MAY (WESTOVER) (1862—). An American journalist and author, born at Afton, Ind., and educated at the University of Colorado and the Denver Business College. For several years she taught music and held positions as soloist in New York City church choirs. Remaining in New York, she was appointed (1887) an inspector of customs, an office which she distinguished by many important seizures of smuggled goods. She acted as secretary to the Commissioner of Street Cleaning for two years, and for a time was employed in the State Museum of Natural History. This position she resigned to enter journalism, as editor of the woman's department, first, of the *New York Recorder*, and afterward of the *New York Tribune*. During her three years with the *Tribune* she planned and founded the International Sunshine Society, of which she became president-general. Although Mrs. Alden accepted a place on the editorial staff of the *Ladies' Home Journal*, she continued to reside in New York. Her published writings include: *Manhattan, Historic: Artistic; Bushy: Child Life in the Far West; Women's Ways of Earning Money* (1904).

ALDEN, HENRY MILLS (1836—). An American editor and author, born at Mount Tabor (near Danby), Vt. He graduated in 1857 at Williams College, where James A. Garfield and Horace E. Scudder were among his fellow-students and in 1860 at the Andover Theological Seminary. Subsequently he was licensed to preach, but was never settled. From 1863 to 1869 he was managing editor of *Harper's Weekly*, and in the latter year became editor of *Harper's Monthly*. In 1863-64 he lectured before the Lowell Institute, Boston, on "The Structure of Paganism." He is known as a classical student of large acquirements, particularly in connection with Greek literature and thought; and his first literary ventures were two articles contributed to the *Atlantic* on the Eleusinian Mysteries. His long editorial service has been unobtrusive but distinctive. His personality has pervaded *Harper's Magazine*, in which he has aimed, among other things, to recognize the novice and to encourage the best type of Americanism. He collaborated with A. H. Guernsey in the preparation of *Harper's Pictorial History of the Great Rebellion* (1862-65); and has published *The Ancient Lay of Sorrow*, a poem (1872), and two profound metaphysical essays, *God in His World* (1890, published anonymously), *A Study of Death* (1895), both extensively read and enthusiastically received by critics, and *Magazine Writing and the New Literature* (1908). With William Dean Howells he has edited numerous collections of stories by American writers.

ALDEN, Mrs. ISABELLA MACDONALD (1841—).

An American author, writing under the pseudonym of "Pansy." She was born at Rochester, N. Y. In addition to much fiction for older readers, her works include the *Pansy Books*, a series of about 75 juvenile works, a life of Christ, called *The Prince of Peace* (rev. ed., 1908); a novel, *Unto the End* (1902). Among later books are *Her Own Way* (1912); *A Long Way Home* (1912); *A King's Daughter* (1913). She edited the young folks' journal *Pansy* from 1873 until 1896, and was at various times on the editorial staff of the *Christian Endeavor World* and other religious magazines, Japanese as well as American. Her works have been translated into many foreign languages.

ALDEN, JAMES (1810-77). An American naval officer, born in Portland, Me. He entered the navy as midshipman in 1828, was in the Wilkes exploring expedition to the Antarctic (1838-42), in several naval operations of the Mexican War (1848), and from 1848 to 1860 in the coast survey. In the Civil War he commanded first the steamer *South Carolina* and then the sloop-of-war *Richmond*, being present at the capture of New Orleans and the attack on Port Hudson. He was promoted to be captain in 1863 and commanded the sloop *Brooklyn* in Mobile Bay and at Fort Fisher. He became a commodore in 1866, was placed in command of the Mare Island (Cal.) navy yard in 1868, and in 1869 was appointed Chief of the Bureau of Navigation. He was promoted to the rank of rear admiral in 1871 and took command of the European squadron; he was retired in 1873.

ALDEN, JOHN (1599-1687). One of the Pilgrim Fathers. He was born in England. As a cooper, he was engaged in making repairs on the *Mayflower* at Southampton, and sailed in her, signing the compact. He settled at Duxbury, Mass., and married Priscilla Mullens. Their courtship forms the theme of Longfellow's poem, *The Courtship of Miles Standish*. He was a magistrate for more than 50 years and greatly assisted in the government of the infant colony. He outlived all the other signers of the compact.

ALDEN, RAYMOND MACDONALD (1873—). An American scholar and educator, born in New Hartford, N. Y. After studying at Rollins College, Fla., and at the University of Pennsylvania, from which he graduated in 1894, he took post-graduate courses at his alma mater and at Harvard. In 1894-95 he was instructor in English at Columbian (now George Washington) University; in 1896-97 assistant in English at Harvard; and in 1898-99 senior fellow in English at the University of Pennsylvania. Chosen to fill the assistant professorship of English literature and rhetoric at Leland Stanford, Jr., University (1899), he became associate professor in 1909. In 1911 he accepted the chair of English at the University of Illinois. His writings include: *The Rise of Formal Satire in England* (1899); *The Art of Debate* (1900); *On Seeing an Elizabethan Play* (1903); *Consolation: An Ode* (1903); *Knights of the Silver Shield* (1906); *An Introduction to Poetry* (1909); *A Palace Made by Music* (1910). He also edited several plays of Shakespeare and other Elizabethan dramatists and in 1910 an edition of Thoreau's *Walden*. Alden became known as a contributor of articles to educational journals and short stories to magazines. In 1913 he edited an edition of Shakespeare's *Sonnets* and *A Lover's Complaint*.

ALDEN, TIMOTHY (1823-58). An American inventor of a machine for setting and distributing type. He was born at Barnstable, Mass., and was sixth in descent from John Alden, the *Mayflower* Pilgrim. In early life he was a compositor in his brother's printing office, and while thus engaged is said to have declared: "If I live long enough I will invent a machine to do this tiresome work." After the inventor's death the machine was improved by Henry W. Alden.

ALDEN, WILLIAM LIVINGSTON (1837-1908). An American author. He was born in Williamstown, Mass., and was educated at Lafayette and Jefferson colleges. In 1865 he joined the editorial staff of the *New York Times* and at once attracted attention by his humorous writings. During President Cleveland's first administration (1885-89) he was Consul-General of the United States at Rome, and at the expiration of his term was made Chevalier of the Order of the Crown of Italy by King Humbert. In 1893 he settled in London and became literary correspondent of the *New York Times*. Among his publications are: *Domestic Explosives* (1878); *Shooting Stars* (1879); *Moral Pirates* (1881; new ed., 1908); *Life of Christopher Columbus* (1881); *Cruise of the "Ghost"* (1882; new ed., 1909); *Cruise of the Canoe Club* (1883); *A Lost Soul* (1892); *The Mystery of Elias G. Roebuck* (1896); *His Daughter* (1897); *Dewitt's Dream* (1902); *New Robinson Crusoe* (1903); *Cat's Tales* (1905); *Jimmy Brown Trying to Find Europe* (1905).

ALDER, al'dēr (Lat. *alnus*). A genus of plants of the natural family Betulaceæ. (See BIRCH.) The genus consists of trees and shrubs, natives of cold and temperate climates; the flowers in terminal, imbricated catkins, which appear before the leaves in some species, though in other species leaves and flowers appear simultaneously. In *Alnus maritima* the flowers appear in the autumn, and the fruits ripen in the following season. The common or black alder (*Alnus glutinosa* or *vulgaris*) is a native of Great Britain, northern Africa, and of the northern parts of Asia, and escaped from cultivation in America. It has roundish, wedge-shaped, obtuse leaves, lobed at the margin and serrated. The bark, except in very young trees, is nearly black. It succeeds best in moist soils and helps to secure swampy river-banks against the effects of floods. It attains a height of 30 to 60 feet. The wood is of an orange-yellow color. It is not very good for fuel, but affords one of the best kinds of charcoal for the manufacture of gunpowder, upon which account it is often grown as coppice-wood. Great numbers of small alder trees are used in Scotland for making staves for herring barrels. The wood is also particularly valuable on account of its property of remaining for a long time under water without decay, and is therefore used for the piles of bridges, for pumps, sluices, pipes, cogs of mill-wheels, and similar purposes. The bark is used for tanning and for dyeing. It produces a yellow or red color, or, with copperas, a black color. The leaves and female catkins are employed in the same way by the tanners and dyers of some countries. The bark is bitter and astringent. The individual tree, viewed by itself, may be regarded as somewhat stiff and formal in appearance, but in groups or clusters it is ornamental. The northern limit of the common alder is the Swedish shore of the Gulf of Bothnia, in the

south of Angermannland, where it is called the sea alder, because it is only in the lowest grounds, near the sea, that it occurs. The gray or white alder (*Alnus incana*), a native of many parts of continental Europe, especially of the Alps, and also of North America and of Kamtchatka, but not of Great Britain, differs from the common alder in having acute



ALDER LEAF AND CATKINS.

leaves, downy beneath, and not glutinous. It attains a rather greater height, but in very cold climates and unfavorable situations appears as a shrub. It occurs on the Alps at an elevation above that to which the common alder extends, and becomes abundant also where that species disappears in the northern part of the Scandinavian peninsula. The bark is used in dyeing. *Alnus cordifolia* is a large and handsome tree, with cordate acuminate leaves, a native of the South of Italy, but found to be quite hardy in England. Some of the American species are mere shrubs. The bark of the smooth alder (*Alnus rugosa*), found from south New England to Wisconsin, Kentucky, and Florida, is used in dyeing. The green or mountain alder (*Alnus crispa*) ranges from north New England to the shores of Lake Superior, and northward and southward to North Carolina. *Alnus oregona* is a handsome species of the northern Pacific coast region. In the mountain regions of Alaska and elsewhere alders are the first arborescent growth to succeed conifers swept away by avalanches, etc.

Fossil Forms. Leaves of a plant doubtfully allied to the alder have been described from the Cretaceous rocks of Greenland and North America under the name *Alnophyllum*, while true alders attained a considerable degree of develop-

ment in Tertiary times throughout the northern parts of Europe, Asia, and Africa.

ALDER FLY. An insect of the family Sialidæ. See CORYDALIS.

ALDERMAN, ʔdër-mən. The designation used in the United States for the representative of the citizens of a district or ward in a city or large town, whose duty it is to attend the local legislature and enact municipal regulations. The title originally derived from the Anglo-Saxon *ealdorman*, compounded of *ealdor*, 'older,' and *man*, and applied to persons of high and hereditary distinction, such as princes, earls, and governors. Whether any definite and invariable functions were connected with the ancient rank of *ealdorman* does not seem to be very clearly ascertained. There were also aldermen of counties, hundreds, cities, boroughs, and castles. At present in England, Wales, and Ireland, aldermen are officers invested with certain powers in the municipal corporations, either as civil magistrates, or as deputies of the chief civil magistrates in cities and towns corporate. The corresponding title in Scotland is bailie. In the majority of American cities aldermen form a legislative body, having limited judicial powers in matters of internal police regulation, etc., though in many cities they hold separate courts and have magisterial powers to a considerable extent. (See sections on *Local Government* in the articles on the important countries and articles on American cities.)

ALDERMAN, EDWIN ANDERSON (1861—). An American educator, born at Wilmington, N. C., and educated at the university of that State. He was professor of English in the North Carolina State Normal College in 1892; professor of pedagogy at his alma mater in 1892-96, and president of that institution in 1896-99. In June, 1904, after four years as president of Tulane University, he became president of the University of Virginia. He also served as district director of the Southern Education Board and as editor-in-chief of *The Library of Southern Literature*. His writings include several biographical and historical works.

ALDERMAN LIZ'ARD. The name, in California, of the obese Chuckwalla (q.v.).

ALDERNEY, ʔdër-nī (Fr. *Aurigny*, the *Riduna* of Antoninus). One of the Channel Islands (q.v.), separated from Cape La Hague, France, by a perilous channel, 7 miles wide, called the Race of Alderney. It is 4½ miles long, with an extreme breadth of 1½ miles and an area of 3 square miles (1962 acres) (Map: France, N., D 2). The southeast coast is lofty and bold; it slopes to the northeast and north, forming small bays. It is strongly fortified, and at Braye there is an extensive granite breakwater, built at an enormous expense by the British government in order to form a naval station and harbor of refuge, but the project was a failure. The dangerous Casket rocks, surmounted by three splendid lighthouses, lie 6 miles southwest. St. Anne, in the centre of the island, is the chief town. Alderney is included in the bailiwick and governorship of Guernsey, but has minor legislative and judicial administrations locally elected. Agriculture and grazing are the only industries. The island is known for a distinctive breed of cows. Pop., 1891, 1857; 1901, 2062; 1911, 2561.

ALDERNEY CATTLE. See CATTLE.

ALDERSGATE, ʔdërz-gät. In the old city wall of London, the gate which stood at the

present junction of Aldersgate Street and St. Martin's-le-Grand. It was between Cripplegate and Newgate. It was rebuilt in 1616, with figures of King James I and of the prophets Jeremiah and Samuel.

ALDERSHOT, ʔdër-shöt (for *Aldersholt*; *holt*, a wood, Ger. *Holz*, wood). A town in Hampshire, England, 14½ miles east of Basingstoke (Map: England, F 5). Its importance arises from the vicinity of the permanent military camp, established here in 1854-55, which accommodates upward of 20,000 troops. An equestrian statue of the Duke of Wellington stands on an eminence called "Cæsar's Camp," which commands a fine view of the manœuvring ground. Aldershot is a busy junction of the London and Southwestern Railway, with two depots, and has all the elements of a thriving town. Pop., 1891, 25,595; 1901, 30,974; 1911, 35,175.

ALDERSHOT CAMP. A permanent camp of the British army, situated about 35 miles southwest of London, England, and used during the spring and summer for army manœuvres on a larger scale than is possible elsewhere in the kingdom. Up to the Boer War of 1899, the Aldershot garrison consisted of troops available for service with the first army corps. It is also used by volunteers and militia during their annual training and is the headquarters for various military instruction.

ALDGATE, ʔld'gät'. The eastern gate in the old city wall of London, near the present junction of Houndsditch, Aldgate High Street, and the Minories. Its date and the origin of the name have been much disputed. The gate probably dated from the late Saxon or early Norman period, and the name, spelled *Alegate* in a document earlier than 1115, seems to mean the 'gate free to all.'

ALDHELM, äld'hëlm (c.640-709). An ecclesiastic, possibly a son of the King of the West Saxons. He was educated at Canterbury, became abbot of Malmesbury about 676, and Bishop of Sherborne in 705, but continued to act as abbot of his monasteries. He was a famous scholar. His works are found in *Migne, Patrologia Latina*, vol. lxxix.

ALDIE, ʔld'i. A village of Loudoun Co., Va., about 35 miles west of Washington, D. C. Here, on June 17, 1863, a force of Federal cavalry under Pleasonton defeated a force of Confederate cavalry under Stuart.

ALDIN, CECIL CHARLES WINDSOR (1870—). An English artist and illustrator, born at Slough and educated at Eastbourne College and Solihull Grammar School. He studied anatomy at South Kensington and animal painting under F. W. Calderon. Within three years after his first drawing was published in the *Graphic* (1891) he was commissioned to illustrate Kipling's *Jungle Stories* for the *Pall Mall Budget*. In 1899-1900 he painted a series of sporting prints in vivid colors, known as "The Fallowfield Hunt," which became so popular as to be reproduced by thousands in England and the United States. Aldin made many drawings for the English illustrated weeklies and for important books, becoming one of the best-known men of the day in his profession. He published, in 1913, *Painting Book: The Farm Yard; Jock and Some Others* (with R. Waylett).

ALDINE (äld'in or ʔld'in) **EDITIONS.** A name given to the books printed by Aldus Manutius and his family, at Venice (1490-1597),

prized for their scholarly correctness, beautiful typography, and tasteful manufacture, and, subsequently, for their rarity. They include editions of Greek, Latin, and Italian writers, in many cases the earliest printed. The first Aldus was an innovator. He first used italic type (1501) and introduced fine paper or parchment editions (1499). He was an artist in the designing of type, having 9 varieties of Greek and 14 of Roman letters. The establishment remained for more than a century in the family, and produced 908 works, which bear its imprint of an anchor with twisted dolphin, often with the Latin motto, *Sudavit et Alsit*. As the editions gained in reputation, they were often counterfeited by printers in Lyons and Florence. The most precious are those of the first 12 years, especially *The Hours of the Blessed Virgin* (1497) and the *Vergil* (1501). See MANUTIUS.

ALDINI, ăl-dē'nē, ANTONIO (1756-1826). An Italian statesman, born in Bologna. He studied law in Rome and became professor of that subject and a practicing barrister there. After the separation of Bologna from the Papal States, he went to Paris and upon his return became president of the Council of Ancients of the Cisalpine Republic. He was dismissed from this position in 1798 because of his opposition to the measures of Napoleon, who, however, in 1801, made him president of the Council of State of the Italian Republic. Of this position he was deprived by Melzi. When the Kingdom of Italy was formed in 1805, Aldini was made a Count, and Secretary of the Interior, in which capacity he drew up the decree dissolving the Papal States. After 1815 he lived in retirement at Milan.

ALDINI, GIOVANNI (1762-1834). A nephew of the famous Galvani and brother of Count Antonio Aldini; a student of natural science. He held the chair of physics at Bologna in 1798, was a founder of the National Institute of Italy, received the British Royal Society's gold medal, and was made Knight of the Iron Crown and Councilor of State at Milan by the Emperor of Austria. He spent much of his fortune in organizing a school of science for workingmen at Bologna. He carried on investigations in applied science and worked out methods of applying galvanism to various useful purposes in medicine and in the industrial arts.

ALDOBRANDINI, ăl'dō-brān-dē'nē. A noble family of Florence, raised to the princely dignity by Pope Clement VIII.—**SALVESTRO ALDOBRANDINI** (1499-1588). A famous teacher of law at Pisa. He led a successful revolt against the Medici in Florence, defended the city against the imperial army of Charles V, and upon its capture was condemned to death, but the intervention of a powerful friend of the Medici caused the change of his sentence to that of banishment in 1530. He went to Rome, Naples, and Bologna, where, in 1538, he became Papal Vice-Legate and Vice-Regent. Realizing the futility of a return to Florence, he went to Ferrara, whence he was called to Rome as fiscal advocate of Pope Paul III.—**IPPOLITO ALDOBRANDINI** (1536-1605). A son of the preceding. He became Pope, with the title of Clement VIII (q.v.)—**PIETRO ALDOBRANDINI** (1571-1621). Cardinal; a nephew of Pope Clement VIII. He continued the policy of Clement and zealously promoted the development of the sciences. The great sums of money which he had accumulated he sought to secure by the purchase of Sulmona,

Bari, and Bisignano. He became Archbishop of Ravenna under Pope Paul V. When the Roman branch of the family became extinct (1681), a dispute as to inheritance and succession arose between the Borghese and the Pamfili branches, and the princely title, as well as the greater part of the fortune, passed to the Borghese branch.

ALDOBRANDINI MARRIAGE, THE. A famous mural painting, since 1818 in the Vatican Library. It was found in 1606 at Rome and was named after its original modern owner, Cardinal Aldobrandini. It is probably of the time of Augustus. The picture contains 10 figures, arrayed in two groups. In the centre of the bridal chamber sits the bride. On the same couch is the *pronuba*, the bride's attendant (a married woman, a Roman practice); close by is a slave woman ready to assist the bride. In the other group, on the left, in a separate chamber, are three women, preparing a bath; on the right, directly before the bridal couch, is the waiting husband. Three women, finally, are busy with a sacrifice and with the bridal song. The picture illustrates Roman bridal ceremonies and is itself illuminated by such a poem as Catullus, lxi; indeed, it has been thought that the picture was intended to illustrate the marriage there described. Others think it a portrayal of the marriage of Peleus and Thetis, others of that of Paris and Helen, and still others simply an ideal picture. It presents the appearance of a frieze, 8 feet long by 4 feet high.

ALDO MANUZIO, ăl'dō mā-nōō'tsē-ō. See MANUTIUS.

ALDRED, ăl'drēd, or **EALDRED** (?-1069). A noted English ecclesiastic. He became Abbot of Tavistock about 1027 and Bishop of Worcester, 1044. He made a pilgrimage to Jerusalem in 1058; was elected Archbishop of York in 1060, and died Sept. 11, 1069. He was very influential under Edward the Confessor, by whom he was employed on embassies. He submitted to and crowned William the Conqueror. He was capable and honest, instituting many reforms, and spending his wealth freely in the service of the Church.

ALDRICH, ăl'drīch or ăl'drīj, ANNE REEVE (1866-92). An American poet and novelist, whose few works gave promise of a brilliant future. She was born at New York, April 25, 1866, and died there June 22, 1892. Her first work, *The Rose of Flame* (1889), was followed by *The Feet of Love*, a novel, in 1890. *Songs about Life, Love, and Death* appeared posthumously in 1892. The general characteristic of her works is intense, passionate, and erotic.

ALDRICH, CHESTER HARDY (1862—). An American public official, Governor of Nebraska, 1911-13. He was born in Pierpont, Ohio, and graduated from Ohio State University in 1888. Admitted to the bar in 1891, he practiced in David City, Neb., for a number of years. His interest in politics led to his election in 1907 to the State Senate and in 1910 to a successful campaign as Republican candidate for governor. For reelection in 1912 he was defeated by J. T. Morehead, Democrat. Governor Aldrich took an active part in the attempt to nominate Theodore Roosevelt for the presidency in 1912, and was one of the seven governors who signed a letter urging the latter to become a candidate.

ALDRICH, HENRY (1647-1710). An English theologian, musician, and architect, dean of Christchurch College, Oxford, from 1689. He

wrote a treatise on logic, *Artis Logicæ Compendium* (1691), which, with notes by Dean Mansel, was used as a text-book at Oxford for more than a century. He designed several of the buildings at Oxford, but is best known for his musical attainments. He wrote on the history of music, and composed services, anthems, and catches. His extensive musical library, second only to that of the British Museum, he left to Christ Church.

ALDRICH, JOHN MERTON (1866—). An American entomologist, born in Olmsted Co., Minn., and graduated from the South Dakota Agricultural College in 1888. Post-graduate studies in entomology he took at the University of Minnesota, the Michigan Agricultural College, the University of Kansas, and, previous to receiving a Ph.D. degree in 1906, at Leland Stanford, Jr., University. He was professor of zoölogy at the University of Idaho and entomologist at the experiment station there maintained from 1893 to 1905, when he was tendered the chair of biology. In 1911 he began special studies of the insects of the western salt and alkaline lakes. His published writings include *Catalogue of North American Diptera* and numerous entomological papers. He was made a member of the executive committee of the Entomological Society of America.

ALDRICH, NELSON WILMARTH (1841–1915). An American politician, born at Foster, R. I. In 1875–76 he was a member of the Rhode Island House of Representatives, and in the latter year its Speaker. He was elected to Congress in 1878 and 1880. In 1881 he resigned to take a seat in the Senate, in which he served continuously for 30 years. In his last 10 years in the Senate he held a position of undisputed leadership, chiefly in consequence of his thorough mastery of the details of parliamentary organization and through his skill in effecting combinations of the representatives of various interests. His policies were ultra-conservative, and his voluntary retirement in 1911 was due largely to the impracticability of checking longer the development of progressive tendencies in his party. Aside from his work in perfecting the senatorial methods of transacting legislative business, Aldrich figures in legislative history chiefly in connection with tariff and currency legislation. The Payne-Aldrich Tariff Act of 1909 was largely shaped by Aldrich and forced through Congress under pressure exerted by him. He was largely responsible for the Aldrich-Vreeland Currency Law, enacted in 1908, and as Chairman of the National Monetary Commission, created by the same act, directed a broad investigation of the banking and currency systems of the United States and of foreign countries, with a view to securing information upon which to base a comprehensive scheme for the reform of the American banking system. In 1911 Aldrich made public a tentative scheme, designed to increase the effectiveness of reserves through their control by reserve associations. (See BANK; BANKING.) The Aldrich plan, though approved in its essential features by most monetary specialists, was received with suspicion by the public, which had come to associate the name of Aldrich with the highly protected interests, the "trusts," and Wall Street. Mr. Aldrich's very considerable financial interests, founded originally upon wholesale trade and later extended to manufactures and speculative finance, and his connections with John D. Rockefeller, Jr., his son-in-

law, explain sufficiently the popular belief that his legislative services were at the command of the large interests. A just view would appear to be that, both in his defense of high protection and in his currency projects, Mr. Aldrich was actuated by a desire to further the material interests of the country as a whole; but that his interpretation of the interests and needs of the country is of a character that prevailed among practical politicians in the last quarter of the nineteenth century rather than that which is generally acceptable in the first quarter of the twentieth century.

ALDRICH, RICHARD (1863—). An American writer on music. He was born in Providence, R. I. While pursuing the regular academic course at Harvard University, he also took the course in music under Prof. J. K. Paine. From 1885 to 1889 he was the musical and dramatic critic of the *Providence Journal*. He has been the musical critic of the *New York Times* since 1902. He translated Lilli Lehmann's *Meine Gesangskunst* (1902) and wrote *A Guide to Parsifal* (1904) and *A Guide to the Nibelungen Ring* (1906).

ALDRICH, THOMAS BAILEY (1836–1907). An American poet, novelist, traveler, and editor. He was born at Portsmouth, N. H., Nov. 11, 1836. After a boyhood spent in New England and Louisiana, he entered a counting-house in New York in 1854. He was employed as "reader" in a publishing house in 1857, and he served successively on the staffs of the *New York Evening Mirror*, the *Home Journal*, and the *Saturday Press*. In 1866 he removed to Boston, where he was editor of *Every Saturday* until 1874. He then became a regular staff contributor to the *Atlantic Monthly*, and on the retirement of W. D. Howells, in 1881, succeeded to the editorship, which he held until 1890. Afterward he devoted himself to literary work and travel. Aldrich is best known as a poet. He has, not very aptly, been called "the American Herrick," owing to the fact that his verse is graceful, light, and melodious, carefully wrought, restrained, and reminiscent of places that he has visited. His chief publications of verse, besides the collective editions, are: *The Bells* (1855); *The Ballad of Babie Bell* (1856); *Pampinea, and Other Poems* (1861); *Cloth of Gold, and Other Poems* (1874); *Flower and Thorn* (1876); *Friar Jerome's Beautiful Book* (1881); *Mercedes, and Later Lyrics* (1883); *Wyndham Towers* (1889); *Unguarded Gates, and Other Poems* (1895). Like his poetry, Aldrich's prose is delicate and finished in style. His best-known piece of fiction is probably *Marjorie Daw* (1873); and his *Story of a Bad Boy* (1870) is also very popular. Other novels are: *Out of his Head, a Romance* (1862); *Prudence Palfrey* (1874); *The Queen of Sheba* (1877); *The Stillwater Tragedy* (1880); and *Two Bites at a Cherry* (1893), a volume of short stories. His volumes of travel and reminiscence are *From Ponkapog to Pesth* (1883) and *An Old Town by the Sea* (1893). In 1905 he published, in blank verse, a tragedy, *Judith of Bethulia*, which was played by Miss Nance O'Neill. His biography, written by Ferris Greenslet (1908), is a fine appreciation of both Aldrich and his writings.

ALDRICH, WILLIAM SLEEPER (1863—). An American scientist and educator, born in Philadelphia, Pa. He graduated from the United States Naval Academy in 1883 and a year later received the degree of M.E. from the Stevens

Institute of Technology. After several years of teaching in high schools he was successively instructor in drawing (1889-91) and associate in mechanical engineering (1891-92) at Johns Hopkins University; professor of mechanical engineering and director of mechanical arts at West Virginia University (1893-99); and professor and head of the department of electrical engineering at the University of Illinois (1899-1901). For the 10 following years he held the position of director of the Thomas S. Clarkson School of Technology. During the Spanish-American War Aldrich saw service with Admiral Sampson's fleet in Cuban waters. He became a member of numerous scientific societies. His published writings include *Notes on Building Construction and Architecture*, with W. H. Browne, Jr., and *Manual for Electrical Engineering Laboratory*, with same (1900).

ALDRIDGE, ă'đrĭj, IRA FREDERICK (c.1810-67), "The African Roscius." There are conflicting accounts of his early life. One is that he was a mulatto, born at Bel Air, Md., about 1810, was apprenticed to a German ship carpenter, accompanied Edmund Kean to England as a servant, returned in 1830 or 1831, and appeared on the stage in Baltimore without success; after which he went back to England and gained a high reputation. Another story is that he was the son of a native of Senegal, who was brought here as a slave, became a Christian, and pastor of Greene Street Chapel (African) in New York; that Ira was born in that city in 1807, and was sent to Glasgow University to be educated for the ministry. Preferring the drama, however, he made his *début* at the Royalty Theatre, London, as Othello, and became remarkably popular. He played also Aaron, in *Titus Andronicus* (1852), and Zanga, Orozembo, Rolla, and other characters for which his color was suited, throughout England. At Belfast he played Othello to the Iago of Edmund Kean, who greatly admired him. In 1852 he appeared in Brussels and thereafter on the Continent took high rank in tragedy. He received crosses and medals from the emperors of Austria and Russia and the King of Prussia and was honored with membership in several of the great academies. He married an Englishwoman.

ALDRINGER, ălt'rĭng-ĕr, also ALTRINGER, or ALDRINGEN, JOHANN, COUNT (1588-1634). A general in the imperial German army during the Thirty Years' War. He was born at Diedenhofen and studied at the University of Paris. As a reward for his defense of the Elbe Bridge at Dessau, April, 1626, against Mansfield, he was created a Count in 1628. He was in high favor with Wallenstein and after the conclusion of peace with Denmark was appointed major-general. In this capacity he served with distinction under Collalto at the siege of Mantua. On his return to Germany, in 1631, he coöperated with Tilly and, upon the death of that commander (1632), became his successor. As field-marshal, he afterward conducted a successful campaign in Franconia, Bavaria, and Swabia against the Swedes. Eventually influenced by the Court party against Wallenstein, he defended the imperial cause, although he adroitly evaded the order to take Pilsen. After Wallenstein's death, he fought against the Swedes on the Danube, where soon afterward he met his death in the defense of Landshut. Consult Ernst Brohm, *Johann von Aldringen* (1882), Hermann Hallwich, *Johann von Aldringen*

(Leipzig, 1885), and J. Krebo, *Zur Beurteilung Holks und Aldringens. Historische Vierteljahrsschrift*, vol. iii (Leipzig, 1900).

ALDROVANDI, ăl'drô-văn'dê, ULISSE (1522-1605). An Italian naturalist. He was of noble birth. He became, in 1554, a professor of philosophy and logic, and in 1560 lectured on botany in the University of Bologna. He also practiced medicine and succeeded, after violent popular opposition, in establishing an inspectorship of drugs and pharmacies. The Pope confirmed him in the office. Afterward he became professor of natural history, established the Botanical Garden of Bologna in 1567, and was employed for many years in forming a collection of specimens as a basis for an encyclopædic work on animal life. To this end he traveled extensively and enlisted the aid of Gesner and others. In this work, and in the preparation of drawings, he expended the greater part of his fortune. He ceased teaching in 1600 and devoted himself to the publication of his great work, issuing four volumes in Latin on ornithology (1559-1603) and one on mollusks. He bequeathed his collections and manuscripts to the Senate of Bologna; the collections became the nucleus of the great museum of that city, and the manuscripts remained in the university library. Ten other volumes, more or less prepared by him, were rapidly brought out by his colleagues and pupils; but many manuscripts and drawings remain unpublished. He did a great service in stimulating scientific study and collected an enormous number of facts and specimens; but his writings were prolix and not discriminative. Nevertheless, some volumes, as those on birds, rapidly ran through several editions, and the entire series was epitomized by Johnstone. Consult his biography by G. Fantuzzi (Bologna, 1774).

ALDUS, ăl'dŭs. See MANUTIUS, ALDUS.

ALE. See BEER; BREWING.

ALEANDER, ăl'ĕ-ăn-dĕr, HIERONYMUS (1480-1542). An Italian humanist and Papal Legate. He was born at Motta, near Treviso, and after a short course in medicine devoted himself to the study of theology and languages. He entered the service of the Bishop of Liège, Eberhard of the Mark, in 1514, and in 1519 he went as Papal Legate to Germany, to combat the Lutheran movement. He inspired the famous edict of Charles V against the reformer (May 26, 1521), a document antedated May 8, 1521, and probably emanating from the pen of Aleander. In 1525 he was captured in the battle of Pavia, but was ransomed from the Spaniards for 500 ducats. As Legate to Germany in 1532, he unsuccessfully endeavored to frustrate the Peace of Nuremberg. In 1536 Pope Paul III appointed him a member of the reform commission under Contarini (q.v.), and two years afterward he was created Cardinal and was again sent to Germany; but his mission proved unproductive of results. His letters and reports are valuable historical documents, and his celebrated writing, *De Concilio Habendo*, is said to have been consulted at the Council of Trent. For his biography down to 1529, consult J. Paquier (Paris, 1900); also in general, Brieger, *Aleander und Luther 1521* (Gotha, 1884); Kelkoff, *Die Depeschen Aleanders vom Reichstag zu Worms* (Halle, 1886).

ALEARDI, ăl'ă-ăr'dĕ, ALEARDO (1812-78). An Italian patriot and poet, formerly hailed as a rival of Prati. He was born at Verona, studied law at Padua, and was active in the outbreak of

1848. He was sent by the short-lived Venetian Republic to represent its interests at Paris. After the Republic's downfall, his connection with later conspiracies caused his imprisonment at Mantua, 1852, and at Verona and Josefstadt in 1859. Here he remained until liberated by the Peace of Villafranca. He subsequently became professor of æsthetics at Florence, Deputy in the Italian Parliament, and finally Senator. He died at Verona, which has perpetuated his memory by a monument and by a bridge named in his honor. Aleardi's poems will live on account of their artistic finish and their delicate appreciation of nature, but they are marred by a prevailing lack of force and are overburdened with imagery. The best include *Il monte Circello*, *Un' ora della mia giovinezza*, and *I sette soldati*, which was dedicated to Garibaldi, and *Le Città Italiane Marinare e Commerciantie*, considered by many his finest poem, and recounting the rise, flourishing, and fall of the maritime and commercial cities of Italy: Venice, Florence, Pisa, and Genoa. An edition of his collected poems appeared at Florence (1862), and a fifth edition with additional material appeared in the same city in August, 1878, shortly after his death. His *Epistolario* was published, with an introduction by G. Trezza, in Verona, 1879. Consult Augusto Bazzoni, *Aleardo Aleardi*, Turin, 1863, for a brief sketch of the man and his work.

ALECSANDRI, ä'lëk-sän'drë, or **ALEXANDRI**, VASILIO, or BASIL (1821-90). A Rumanian patriot and poet. He was born in northern Moldavia, studied at Paris from 1834 to 1839, took part in the revolutionary movement of 1848 in Rumania, and was obliged to seek refuge in Paris. In 1859 and 1860 he was Minister for Foreign Affairs, was elected to the upper chamber in 1879, and in 1885 was appointed Minister at Paris. He was always active in seeking the freedom and unity of Rumania. He collected *Poesii populare ale Românilor* (1853), and wrote *Les doines* (1853) and *Doine si lacrimioare* (1863), two volumes of verse, and the dramas *Despot Voda* ('Prince Despot,' 1880); *Fîntîna Blandusiei* (1884), and *Ovidiu* ('Ovid,' 1885). His *Opere* appeared in seven volumes in 1873-76.

ALEC'TO (Gk. Ἀληκτώ, *Alëktō*, from *à*, *a*, priv. + *λήγειν*, *lëgein*, to stop, to cease, The Tireless). The name of one of the three Eumenides (q.v.).

ALEC'TROMAN'CY. See SUPERSTITION.

ALEDO, ä-lë'dō. A city and the county-seat of Mercer Co., Ill., 35 miles southwest of Rock Island, on the Rock Island Southern and the Chicago, Burlington, and Quincy railroads (Map: Illinois, B 2). It contains the William and Vashti College, owned and operated by the county, Drury Academy, and a State agricultural experiment station. The city is in a rich farming region and manufactures brick and tile. Pop., 1890, 1601; 1900, 2081; 1910, 2051; 1913 (est.), 2650.

ALEE'. See HELM.

ALEGRIA, ä-lä'grë-ä. A town on the west coast of Cebú, Philippines, on the strait of Tanon, 55 miles southwest of the town of Cebú. Pop., 1903, 9579.

ALEMAN, ä'lä-män', MATEO (1547-1615?). A famous Spanish novelist, born at Seville in September, 1547. Little is known of his life except that he took his bachelor's degree at Seville in 1565, was appointed to the royal treas-

ury in 1571 or 1572—a position which he resigned after 20 years, as poor as when he assumed it—and emigrated to America in 1608 and probably died in Mexico (where he seems to have been established as a printer by 1609) some time after 1615. His writings include a poetical biography of St. Anthony of Padua (1604) and an *Ortografia castellana* (Mexico, 1609). In 1613 he published the *Sucesos de D. Frai Garcia Gera, arzobispo de Mejico*, and the *Oracion funebre* for the said archbishop. His great work, however, is *Guzman de Alfarache* (1599, second part probably in 1604), a novel with a rogue for the hero, which revives the picaresque tradition of Mendoza's *Lazarillo de Tormes*. *Guzman* at once became exceedingly popular, and within six years had run through 26 editions, aggregating upward of 50,000 copies, besides being translated into French and Italian. In 1623 James Mabbe published the first English version, of which Ben Jonson wrote: "This Spanish Proteus, though writ but in one tongue, was formed with the world's wit." Both in the delineation of manners and in the purity of style, *Guzman* ranks next to *Lazarillo*, which is recognized as the enduring type of the comic prose epic. While lacking the originality, conciseness, and caustic humor of the unknown author of *Lazarillo*, Aleman shows keen powers of observation and a wide knowledge of human nature; and in *Guzman* he has given the world a most diverting study of blackguardism, his hero showing all the resources of a consummate rascal in the various characters of stable boy, beggar, thief, coxcomb, mercenary, valet, and merchant. The book, however, is marred by the moral reflections of the author, which obtrude themselves with somewhat wearisome persistence. The most available editions of *Guzman* are: Aribau's in the *Biblioteca de autores españoles*, vol. iii (Madrid, 1846); Cejador's in the *Biblioteca Renacimiento* (Madrid, 1913). For a critically annotated edition of the *Sucesos*, see A. H. Bushee, "Les Sucesos de Mateo Alemán" (*Revue Hispanique*, xxv, New York, 1911); *Bibliotheca Romanica*, vols. 183-187; *Biblioteca Espanola*; Mateo Aleman, *Guzman de Alfarache*, Primera Parte (Strassburg). Consult: Chandler, *Romances of roguery* (New York, 1899); De Haan, *The Novela Picaresca* (Baltimore, 1900); *Discursos leidos ante la Real Academia Espanola por los excmos senores D. Francisco Rodriguez Marin y D. Marcellino Menendez y Pelayo, en la recepcion publica del primero* (Sevilla, 1907; the first of these discourses is devoted to Aleman).

AL'EMAN'NI, more correctly spelled **ALAMANNI**. The name of a military confederacy of several German tribes which began to appear on the lower and the middle Main about the beginning of the third century. Caracalla fought with them first on the Main in 211 A.D., but without conquering them; Alexander Severus (q.v.), after his war in the East, marched against them, but was slain by his soldiers in a mutiny. Maximinus (q.v.), successor of Severus, finally drove them beyond the Rhine. After his death they again invaded Gaul, and even threatened Italy, but were defeated by Postumus who pursued them into Germany and fortified the boundary of the Roman territory called the Agri Decumates. The mounds near Pforung, on the Danube, the rampart extending through the principality of Hohenlohe to Jaxthausen, and the ditch with palisades on the north side of the Main, are remains of these

fortifications. The Alemanni, however, did not desist from their incursions, although repeatedly driven back. After 282, being pressed upon from the northeast by the Burgundians, they made permanent settlements within the Roman boundary from Mainz to Lake Constance. Constantius twice defeated them as they were raiding Gaul. Julian, too, came (357) to the relief of Gaul, which had been again suffering from the incursions of the Alemanni, and soon compelled eight chiefs to sue for peace. Their united force, in their principal battle with Julian, amounted to 35,000 men. After the fifth century the confederated nation is spoken of as Alemanni and Suavi or Suevi. During the fourth century they had crossed the Rhine, and extended as far west as the Vosges and south to the Helvetian Alps. At length Clovis broke their power in 496 and made them subject to the Frankish dominion. The southern part of their territory was formed into a duchy, called Alemannia (q.v.). The name of Swabia was later applied to the part of the duchy lying east of the Rhine. From the Alemanni the French have given the name of Allemands and Allemagne to Germans and Germany in general, though the inhabitants of the north of Switzerland, with those of Alsace and part of Swabia, are the proper descendants of the Alemanni. See ALMAIN. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

AL'EMAN'NIA, or **AL'AMAN'NIA**. The country of the Alemanni (q.v.). The region included part of the later Switzerland and Tyrol. In the tenth and eleventh centuries Alemannia, or Swabia (q.v.), was one of the four great duchies of the German kingdom.

ALEMBERT, ä'län'bâr', JEAN LE ROND D'. See D'ALEMBERT.

ALEM'BIC (formed by the Arabs from their article *al* and Gk. ἀμβίξ, *ambix*, a goblet). A form of still introduced by the alchemists, who



ALEMBIC.

used it in manipulative chemistry for distillation and sublimation.

ALEMTEJO, ä'län-tä'zhü (literally, in Portuguese, 'beyond the Tagus'). A province in the south of Portugal, bounded by the province of Beira on the north, Spain on the east, Algarve on the south, Estremadura and the Atlantic Ocean on the west (Map: Portugal, B 3). Area, 9431 square miles. Alemtejo, although the largest, is the most sparsely populated province of Portugal. The eastern and southern parts are covered with low, detached mountains, rising to nearly 2000 feet on the southern frontier. These are generally well wooded, oaks and chestnuts predominating. The chief rivers are the

Guadiana, Tagus, and Sado. The climate is hot, and swamps, especially those along the coast, render it unhealthy. Fertile plains are found in the northeast, where wheat, barley, corn, rice, and fruit are grown in considerable quantities. The rearing of domestic animals, horses especially, is an important occupation. Manufacturing industries and commerce have been neglected, but some fine olive oil is produced. There are iron mines and quarries, but the mineral wealth of the province has been little developed. Administratively, Alemtejo is divided into the three districts of Portalegre, Evora, and Beja. Pop., 1890, 388,813; 1900, 416,105; 1910, 478,584.

ALENCAR, ä'län-kär', JOSÉ MARTINIANO D' (1829-77). A Brazilian jurist and novelist, born at Fortabza. He studied law at São Paulo and became a brilliant advocate. In 1868 he was elected deputy for Ceará as a Conservative and in 1868-69 was Minister of Justice. His works, chiefly fiction, most of the material for which is drawn from Indian legend, include *O Guarany*, *Iracema*, *O Gaucho*, and *Urabijara*.

ALENÇON, *Fr. pron.* ä'län'sôn'; *Eng. pron.* ä-lën'sön. The capital of the department of Orne, in Normandy, France, situated on the Sarthe (Map: France, N., F 4). The surrounding region is fertile, and the town is one of the brightest and freshest looking in France. It is the seat of a bishop, and the cathedral is its principal building. Three battlemented towers, the only portion of the old castle which remains, are used as the Hôtel de Ville. The town church—a structure of the sixteenth century, containing the remains of the tombs of the Alençon family, few members of which survived the Revolution—is built in the Gothic style. The inhabitants produce excellent woolen and linen stuffs, embroidered fabrics, and straw hats, and manufacture leather and vehicles. The manufacture of point d'Alençon lace and of Alençon diamonds is no longer important. Pop., 1901, 17,270; 1906, 17,843; 1911, 17,378. Consult Odolant-Desnas, *Mémoires historiques sur la ville d'Alençon* (Alençon, 1787).

ALENÇON, FERDINAND PHILIPPE MARIE, DUC D' (1844-1910). A French nobleman, born at Neuilly, the second son of Louis, Duc de Nemours, and the grandson of Louis Philippe, King of France. He was fourth in order of succession to the French throne, being second cousin to the Duc d'Orléans, the French Pretender. In 1868 he married Sophie, Herzogin zu Bagern, who died in 1897, leaving him two daughters and a son. The greater portion of his later years was spent at his villa at Wimbledon, England.

ALEP'PO (Ar. *Haleb*). One of the most important cities of Syria, and capital of the Turkish vilayet of Aleppo (33,436 square miles; pop., 995,800) (Map: Turkey in Asia, G 4). It is about 80 miles east of the Mediterranean Sea, on both banks of the Kuwek, in about 36° 12' N. lat., and 37° 12' E. long. It is surrounded by hills and has regular and clean streets. In the northwestern part stands the citadel, situated on a hill and surrounded by a deep moat. The town was formerly surrounded by a strong wall, of which only a small portion is left, the remainder, together with many of the public buildings, having been destroyed by the earthquake of 1822. The bazaar is extensive and well built. The European colony of Aleppo is considerable, and there are several European

schools and Christian churches. Among the mosques the most noteworthy is the Great Mosque, or *Jami Sakarya*, containing the alleged remains of Zacharias, the father of John the Baptist. Before the earthquake of 1822, and repeated visitations of the plague and cholera, Aleppo was a great commercial centre in spite of its inland position. It supplied a large part of the Orient with various fabrics of wool, cotton, silk, and silver and gold ware. The trade is still considerable, and its chief exports are wool, cotton, grain, gums, saffron, sesame, and hides. Some silk embroidery, carpets, and leather goods are manufactured. The chief port of Aleppo is Alexandretta (q.v.). The importation of European goods by native merchants has increased rapidly. Aleppo is the seat of a United States consul and several European consuls. The population is estimated at about 200,000, of whom probably more than three-fourths are Moslem. Aleppo is believed to be of great antiquity. In ancient times its name was Berœa, given to it by Seleucus Nicator. It was attacked and taken repeatedly by the Saracens and Mongols, and suffered considerably from earthquakes during the twelfth century. In 1516 Aleppo was wrested from the Mamelukes by the Turkish Sultan Selim, and it became the capital of a pashalic. The city is supposed to have contained in those times about 300,000 inhabitants and carried on a large trade by caravans, which subsequently fell off on account of the discovery of the sea route to the East Indies. In 1850 there was an uprising of Christians, suppressed only after considerable bloodshed. Massacres of Christians occurred in 1862. Consult E. Blochet, "L'histoire d'Alep," in the *Revue de l'Orient Latin* (Paris, 1897).

ALEPPO BUT'TON. See BOIL.

ALER, ä'lër, PAUL (1656-1727). A Jesuit and scholastic, born at St. Veit, Luxemburg. After teaching at Cologne, he became professor of theology at Trèves, and in 1703 regent of the gymnasium of Cologne. In 1713 he became regent of the gymnasia at Aix-la-Chapelle, Münster, Trèves, and Jülich. His best-known work is the *Gradus ad Parnassum* (1702; 8th ed., 1879). He wrote 11 tragedies, some in Latin and some in German, and other works on philosophy, philology, and poetry.

ALES, ä-lës', or **ALESSE,** ALEXANDER. See ALESIIUS, ALEXANDER.

ALESHKI, ä-lyësh'kê, formerly DNEIPIROVSK. The chief town of a district, in the government of Taurida, Russia, on the Dnieper River, 3 miles southeast of Kherson, and 153 miles northwest of Simferopol, the capital of the government (Map: Russia, D 5). There is considerable trade, and the inhabitants are engaged principally in agriculture and fishing. Pop., 1897, 9100. It was founded by the Genoese in the tenth century and called by them Elice.

ALESIA, ä-lë'shî-â. A town of Gaul, the capture of which, in 52 B.C., forms one of Cæsar's greatest exploits. The Gauls were making a last effort to shake off the Roman yoke, and Vercingetorix, their bravest leader, after several defeats, had shut himself up with 80,000 men in Alesia, there to await the reënforcements expected from a general insurrection of the Gauls. The town was on a lofty hill and well calculated for defense. Cæsar, with 60,000 men, surrounded the place, with the view of starving it into surrender. He fortified his position by two lines of ramparts of prodigious extent and strength

—one toward the town, for defense against the sallies of the besieged, the other toward the plain, against the armies of relief. Before the relieving forces could assemble, 250,000 strong, he was ready for them; and all their assaults, combined with the desperate efforts of the besieged, were of no avail. Alesia was obliged to surrender, and Vercingetorix was made prisoner. See Cæsar, *De Bello Gallico*, vii. Alesia was afterward a place of some note under the Empire, but was destroyed by the Normans in 864. Near the site of Alesia, west of Dijon, stands the modern village of Alise Sainte-Reine, near which, on the summit of Mont-Auxois, Napoleon III erected a colossal statue of Vercingetorix.

ALESIIUS, ä-lë'shî-üs, ALEXANDER (1500-65). A Protestant theologian. His original name was Ales, but he was also called Alesse, ab Ales, and Alane. He was born in Edinburgh, studied at St. Andrews, became a canon of the Collegiate Church, and contended vigorously for scholastic theology. He was appointed (1528) to refute the reformed views of the Scotch protomartyr Patrick Hamilton, but the result was that his own faith in the old church was shaken, though he long kept the fact secret. For a sermon against dissoluteness among the clergy he was put in prison (1531), whence he escaped to the Continent (1532), traveled in Europe, and settled in Wittenberg, where he met Melancthon. Meantime he was condemned in Scotland (1534), for heresy, without a hearing. After Henry VIII broke with the Church of Rome, Alesius went to England (1535) and was cordially received by the King, Cranmer, and Cromwell, and was appointed lecturer on theology at Cambridge. But he gave offense, and soon went to London and practiced medicine. In 1540 he returned to the Continent and was chosen to a theological chair at Frankfort-on-the-Oder, the first professor who taught the reformed doctrines. In 1543 he quitted Frankfort for Leipzig, where he filled a similar professorship until his death. He visited England in 1549. He died at Leipzig.

ALESSANDRIA, ä'lës-sän'drê-â. Capital of the Italian province Alessandria (c.1980 square miles; estimated pop., 1911, 850,000), a strong fortress in a marshy region on the Tanaro, 47 miles from Genoa by rail (Map: Italy, C 3). Its chief ecclesiastical buildings are the cathedral, rebuilt in the beginning of the nineteenth century, and the old church of Santa Maria di Castello. There are a royal palace, an old castle, and extensive barracks. Noteworthy is the Academy of Sciences and Arts, founded in 1562. Alessandria has cotton, woolen, and linen mills, hat factories, etc. The city derives considerable commercial importance from its position on the chief railway lines of eastern Italy. Population of commune, 1901, 71,298.

Alessandria was founded in 1168 by the inhabitants of Cremona, Milan, and Placentia, as a bulwark against Frederick Barbarossa, and was named Alessandria in honor of Pope Alexander III. Frederick tried to capture it, but failed. As it was a fortress to guard the passage of the Bormida and Tanaro, and also the central point of communication between Genoa, Milan, and Turin, the town was often a scene of battle. It was taken and plundered in 1522 by Duke Sforza; besieged, but without success, by the French, under the Prince of Conti, in 1657; and taken, in spite of obstinate resistance, by Prince Eugene, in 1707. After the prostration of Austria at the battle of Marengo, in

1800, Bonaparte concluded an armistice at Alessandria, in accordance with which Upper Italy, as far as the Mincio, was ceded to the French, with 12 fortresses. It was the principal stronghold of the Piedmontese during the insurrection of Lombardy and Venetia in 1848-49, when many new fortifications were added; those built by the French during their occupation, 1800-14, had been destroyed by the Austrians in 1815.

ALESSI, à-lès'sè, **GALEAZZO** (1512-72). An Italian architect of the late Renaissance, born in Perugia. He was associated with Michelangelo at Rome in 1536, but followed more the manner of Vignola, adopting a formal, classic style. Aside from a few works at Perugia, his masterpieces are at Genoa, whose famous palace architecture he helped develop, especially the Via Nuova (now Garibaldi), with the Cambiaso, Spinola, Serra, and other palaces. He built the Palazzo Marini, now the Municipal Palace of Genoa. Of his Genoese villas, the most beautiful is the Pallavicini; the domical church of the Carignani is his one important ecclesiastical work. His influence was felt throughout Italy, and in France, Portugal, and Flanders.

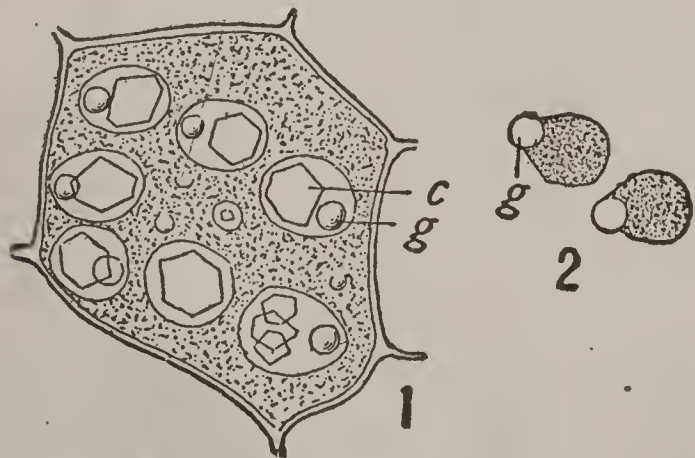
ALESUND, ò'le-sun or a'le-sun, or **AALESUND**. A town in the Norwegian province of Romsdal, on two islands of the Skjærgaard Archipelago (Map: Norway, C 5). The harbor is excellent, and the inhabitants of the town carry on a large cod-fishing trade. Houses are almost entirely of stone, the town having been rebuilt largely since 1904, when it was nearly gutted by a disastrous fire. A statue of the Emperor William II commemorates the assistance rendered by the Germans at that time. Pop., 1900, 11,700; 1910, 13,858.

ALETIA. See COTTON INSECTS.

ALE'TRIUM. A town of ancient Italy, in Latium. See ALATRI.

ALEU'ROMAN'CY. See SUPERSTITION.

ALEURONE, à-lū'rôn (Gk. *ἄλευρον*, *aleuron*, wheaten flour). The stored proteid which occurs as minute granules in the food-bearing tissue (*endosperm*) and embryos of many seeds. The granules are much smaller than starch grains, with which they often occur. They are usually rounded in form (though the so-called proteid crystals of some plant tissues are angu-



ALEURONE.

1. A cell from the Castor bean, as seen in water, showing roundish aleurone grains imbedded in the protoplasm. In each, one or more crystals, *c*, and usually a globoid, *g*.

2. Isolated aleurone grains of the same, as seen in olive oil.

lar), and may be simple or complex in structure. The more complex form of granule consists, in great part, of amorphous proteid substance, in which lie imbedded a large crystalloid and a much smaller globoid. The crystalloid is an angular mass of proteid material, differing

from most true crystals by swelling in water; the globoid is a nearly spherical mineral concretion, consisting mainly of a double phosphate of magnesium and calcium. Seeds rich in aleurone are the castor bean (*Ricinus*), the Brazil nut (*Bertholletia*), peas, beans, etc. See PROTEINS.

ALEUTIAN ISLANDS (à-lū'shan). An archipelago stretching about 800 miles westward from the extremity of the Alaska Peninsula, and forming with the Commander Islands of Siberia a broken barrier between Bering Sea and the Pacific Ocean. There are about 150 different islands, varying in size from rock pinnacles to land masses like Unimak Island, 65 miles long and 25 miles wide, which lies at the eastern end of the chain. The islands lie in a belt 20 to 50 miles wide, between long. 163° 30' W. and 172° 22' E., and lat. 51° and 54° 50' N. They are mountainous, the highest peaks being Mount Shishaldin (8000 feet) on Unimak Island and Mount Makushin (4000 feet) on Unalaska Island, both active volcanoes. There is no timber on the islands, but they support a luxuriant growth of grass and abundant wild flowers. The soil is fertile, and the growing season long enough to mature any vegetables. Cattle have been successfully raised at Dutch Harbor, and the islands undoubtedly have prospective value for grazing purposes. Caribou were formerly found on Unimak Island, but are now extinct; and the rest of the group contains no land animals larger than the fox. The adjacent waters teem with marine organisms, the largest of which are the sea otter (now nearly extinct) and the hair seal. The cod and halibut fisheries are valuable. The precipitation is from 24 to 48 inches, and the mean annual temperature about 40°. The harbors are open throughout the year. The population in 1910 was 1083, of which less than 200 were whites. The largest settlements are Dutch Harbor and Unalaska, both on Unalaska Island. The natives, termed Aleuts by the Russians, are closely related to the Esquimaux. The ravages of the Russian fur-traders from 1754 to 1800 at one time threatened almost to exterminate the native population. The Russians practically enslaved the natives, compelling them to capture sea otters. The Aleuts (see ALASKA, *Population*) were long supported by the trade in sea otter skins, but now they make a precarious living by fishing and fox-trapping. There is a small fur trade in the islands, and Dutch Harbor is used as a coaling station by some of the vessels sailing to Nome. They are mostly converts to the Greek church, which maintains missions and schools on Unimak and Attu islands. On Unimak there is also a Methodist mission. There is a lighthouse on the western end of Unimak Island, and the Navy Department is constructing a coaling station on Kiska Island, about midway of the chain. Vitus Bering, a Russian fleet captain, discovered the Aleutian Islands in 1741.

ALE'WIFE (either *aloofe*, the Indian name of the fish, or from its resemblance to a corpulent woman who keeps an alehouse). A small clupeoid fish (*Pomolobus pseudoharengus*), 8 to 10 inches long, closely related to the herring and the shad and resembling the latter in form and color. It is very abundant on the eastern coast of the United States, where it enters Chesapeake Bay and its rivers, the Hudson, and other streams to spawn. Their time of arrival de-

pends upon the temperature, but usually is during the first week of April in the Hudson, somewhat in advance of other fishes. "Their eggs are adhesive, like those of the herring, and stick to the bottom in shoal water, or to anything they may touch, from 60,000 to 100,000 being laid by each female fish at once, almost all of which are devoured by countless enemies before they can hatch." They have also become landlocked in several lakes of western New York. Though inferior to the shad in quality, they are taken in vast quantities (62,000,000 pounds reported in 1896), and are, next to the shad and the salmon, the most important American anadromous food-fish. It is called *gaspereau* by the French-Canadian fishermen, and branch-herring and saw-belly are other local names. In Bermuda the term "alewife" is applied to the round pompano. See Plate of HERRING AND SHAD.

AL'EXAN'DER. The name of eight popes.—ALEXANDER I, Pope about 109–117.—ALEXANDER II (Anselm, Bishop of Lucca), Pope 1061–73. He was one of those raised to the papal see by Hildebrand and showed the latter's zeal in abrogating simony and clerical marriages. He favored William the Conqueror's invasion of England. Through the first part of his reign there was an anti-pope, Honorius II.—ALEXANDER III (Roland of Siena), Pope 1159–81. He had the active opposition of the Emperor Frederick I, who set up three anti-popes in succession. But he finally overcame all his rivals and the Emperor himself. The tragic history of Thomas à Becket comes in his pontificate, and he forced the unwitting cause of the murder, Henry II of England, to do penance for the deed and to restore the church property which he had confiscated. His works are in Migne, *Pat. Lat.*, vol. cc. His *Summa* was separately edited by F. Thaner (Innsbruck, 1874). For his life, consult H. F. Reuter (Leipzig, 1860–64).—ALEXANDER IV (Rinaldo de Conti), Pope 1254–61. He had a controversy with the Emperor Frederick II, and in the last year of his pontificate the Flagellants appeared in Rome.—ALEXANDER V (Pietro Philargi), Pope 1409–10. He was the choice of the Council of Pisa and designed to supersede the two rival claimants to the papal succession. But his rivals would not retire, and he dismissed the council, thus really making more trouble. He conferred upon the mendicant monks the right to hear confession.—ALEXANDER VI (Rodrigo Lenzuoli Borgia), Pope 1492–1503 (1431–1503). The most celebrated of the eight popes of this name, and the most notorious prince of his age. He was a native of Valencia in Spain. He was handsome and gallant, and his early life was flagrantly dissolute; but he was made a Cardinal at the age of 25 by his uncle, Calixtus III, and on the death of Innocent VIII ascended the papal chair, which he virtually bought. The long absences of the popes from Italy had weakened their authority and curtailed their revenues, and, as a compensation, Alexander endeavored to break up the power of the Italian princes and appropriate their possessions for the benefit of his own children, Giovanni, Duke of Gandia, Cesare, Duke of Valentinois, and Lucrezia, the Duchess of Ferrara, borne him by a mistress with whom he lived publicly even during his occupation of the papal seat. To gain his end he employed the favorite weapons of the princes of the Renaissance, perjury, poison, and

the dagger. Modern research discredits the tradition of his death by poison and ascribes it to a fever. The most memorable events of his pontificate were the burning of Savonarola (q.v.), the partition of the New World between Portugal and Spain, and the introduction of the *Index Expurgatorius* of prohibited books. Alexander VI came down to recent times as one of the most nefarious men in history, laden with such vices and crimes as murder, treason, incest, and apostasy. In the nineteenth century, however, serious attempts were made, if not to rehabilitate his character, at least to mitigate the charges brought against him. For the older view in its extremest form, see the *Diarium* of Burchard, master of ceremonies to Alexander VI (Paris, 1883), and Gordon, *Alexander VI and his Son* (London, 1729). For a more charitable estimate, see Roscoe's *Life and Pontificate of Leo X* (London, 1805), and for a well-sustained apology, Leonetti, *Papa Alessandro VI* (Bologna, 1880); Gregorovius, *History of Rome in the Middle Ages*, vols. vi and vii (Eng. trans., London, 1900), while inclining to the generally accepted opinions, deprives Alexander of the qualities of sagacity and fearlessness which no one else denies him, and depicts him as the weak instrument of his ambitious son, Cesare Borgia. Other biographies are by F. Kaiser (Regensburg, 1878) and Clément (Paris, 1882).—ALEXANDER VII (Fabio Chigi), Pope 1655–67. He confirmed the condemnation of Jansenism and had the satisfaction of receiving the Swedish Queen, Christina, the daughter of Gustavus Adolphus, into the Catholic church. Consult his life, by S. Pallavicini (Prato, 1839).—ALEXANDER VIII (Pietro Ottoboni), Pope 1689–91. He published the bull "Inter Multiplices" against Gallicanism.

ALEXANDER I (?–330 B.C.). King of Epirus; son of Neoptolemus and brother of Olympias, the mother of Alexander the Great. He was made King of Epirus by Philip of Macedon, about 342 B.C., and it was at his marriage with Philip's daughter Cleopatra (336 B.C.) that Philip was assassinated. At the request of the Tarentines, Alexander went to Italy (332), to aid them against the Lucanians and the Bruttii, but, after considerable success, was slain by the Lucanians at the battle of Pandosia, in southern Italy.

ALEXANDER I (1857–93). Prince of Bulgaria from 1879 to 1886. He was the second son of Prince Alexander of Hesse by amorganatic marriage with Countess Julia of Hauck. He served in the Russo-Turkish War of 1877–78 on the staff of General Gurko and in the personal suite of the Czar. After the erection of Bulgaria into an autonomous principality, he was elected hereditary prince, April 29, 1879, by the Bulgarian Sobranje, at the instance of Russia, and the choice was confirmed by those powers which had participated in 1878 in the Congress of Berlin. The principality was organized under Russian influence, but at once developed political parties. Alexander began his administration with a Conservative ministry, seeking to maintain a good understanding with Russia and to establish an orderly government. He then tried a Nationalist ministry, but in 1881 dismissed it, convoked the Sobranje, and secured special powers, under which he appointed a Conservative ministry, headed by two Russian generals, Kaulbars and Soboleff. The Conservative party was but a small faction, and Alexander now allied himself with

the Nationalists, who were enabled to assert themselves more and more against the Russian influence. In 1885 eastern Rumelia revolted against its Governor-General, sought aid from Alexander, who assumed the title of Prince of the Two Bulgarias, and accomplished the union in spite of Russian opposition, securing recognition as Governor from the Porte. This brought on a war with Servia, in which Bulgaria triumphed, Prince Alexander conducting his army with courage and skill. In the night of Aug. 20-21, 1886, a conspiracy headed by Zankoff, and inspired by Russian machinations, forced him to sign his abdication, and he was kidnapped and taken into Russian territory. Popular indignation in Bulgaria procured his release, but on September 7 he formally abdicated, fearful of continued opposition from Russia. He had shown a courage, ability, and loyalty to Bulgaria such as had hardly been expected. He died on his estate at Gratz, in Styria. Consult: Soboleff, *Der erste Fürst von Bulgarien* (Leipzig, 1886), trans. from Russian; Draudar, *Prince Alexander of Battenberg* (1884); A. Koch, Alexander's chaplain, *Prinz Alexander v. Battenberg* (Darmstadt, 1887), and Macdonald, *Czar Ferdinand and His People* (New York, 1913).

ALEXANDER I (c.1078-1124). King of Scotland, the fourth son of Malcolm Canmore. He succeeded his brother Edgar in 1107, but he ruled over only the old kingdom of Scotland, north of the Forth and Clyde, Cumbria having been made practically an independent principality by Edgar on his deathbed. Alexander was called "the Fierce," as a result of his campaign against some northern clans who had rebelled because of their aversion to the introduction of English customs. Alexander was naturally inclined to follow English ways, for his mother was Margaret, grandniece of Edward the Confessor, his wife, Sibylla, was a natural daughter of Henry I of England, and he himself had been educated in England. During his reign there was peace between England and Scotland. Yet he worked earnestly for the independence of Scotland, and especially to free the Scottish church from its subjection to either York or Canterbury. He bestowed great gifts on the church and founded several monasteries, including the abbeys of Scone and Inchcolm. He died April 27, 1124, and was succeeded by his brother David.

ALEXANDER I (1876-1903). King of Servia. The son of King Milan and Queen Natalie. On the abdication of Milan, in 1889, he was proclaimed King, under a regency. In 1893 he assumed personal control of affairs, and in 1894 he abolished the Servian Constitution in favor of an earlier and more reactionary one. In July, 1900, he married Madame Draga Mashin, a widow much older than himself. He and his consort were assassinated, June 11, 1903. See **SERVIA**.

ALEXANDER I, PAVLOVITCH (1777-1825). Emperor of Russia from 1801 to 1825. He was born Dec. 23 (12, Old Style), 1777, at St. Petersburg and was the son of Paul I and Maria Feodorovna (born Dorothea of Württemberg). The violent and arbitrary reign of Alexander's predecessor produced a conspiracy to force his abdication in favor of his son. The Polish prince, Adam Czartoryski, a friend of Alexander, who gives a circumstantial account of the conspiracy, says that Alexander was privy to the

plan of forced abdication, but not to the assassination. The news of the accession of Alexander was received, according to the Russian historian Karamsin, as "a message of redemption." Alexander had been educated under the direction of his grandmother, Catharine II, by eminent instructors, chief among whom was the Swiss Colonel LaHarpe, whose ability and liberal views made a strong impression upon the imaginative character of his pupil. His education, however, was still incomplete when broken off by the dismissal of LaHarpe, on account of his sympathy with the French Revolution. Alexander received a military training which was equally incomplete. His defective education, his experiences in the courts of his great but despotic and immoral grandmother and of his half-insane father produced a curious mingling of characteristics and tendencies. Czartoryski speaks of the frank avowal made to him in 1796 by Alexander of his sympathy with republicanism and his belief that hereditary power was unjust and absurd. The tragedy with which his reign began also made its impression.

He began his reign with sweeping reforms. He abolished the barbaric and excessive punishments in use under his predecessors, restrained the brutality of the police, did away with the secret tribunal, pardoned many of his father's victims, and in other ways reformed the laws and procedure. Restrictions upon literature, art, and trade were removed. "I would not place myself above the law, even if I could," Alexander wrote to the Princess Galitzin, "for I do not recognize any legitimate power on earth that does not emanate from the law. . . . The law should be the same for all." He was aided in his work by four intimate friends, young men of liberal views—Count Paul Strogonoff, Prince Victor Kotchubei, Nicholas Novossiltsoff, and Prince Adam Czartoryski. These Alexander called his "committee of public safety." They deliberated the duties and the limitations of the imperial power—a new question in Russia, and not much considered since that time. In 1801 the Senate was made the supreme high court, its ukases to be subject only to the imperial veto. The first move of the Senate in opposition to the Emperor, however, met with a sharp rebuke, and Czartoryski well explains the attitude of Alexander: "The Emperor liked the forms of liberty as we like spectacles. . . . He would have willingly consented that the whole world should be free on condition that the whole world should submit voluntarily to his single will." The Russian Senate, in which the idle nobility were shelved, was not the body with which to experiment in parliamentary government. Alexander and his associates discussed the emancipation of the serfs; but the time seemed hardly ripe for that measure. An imperial ukase of March 3, 1804, attempted to ameliorate their condition.

The real administrative achievement of Alexander was the creation by the ukase of Sept. 8, 1802, of the ministries, eight in number: Interior and Police, Finance, Justice, Public Instruction, Commerce, Foreign Affairs, Marine, and War. This was a marked step toward an orderly government from the semi-Asiatic methods by which the growing Empire had been managed. Each department was in charge of a minister and an adjunct. Progress was made toward a codification of the laws. The privilege hitherto held by the nobles only, that their

patrimonial estate should not be confiscated as a punishment, was made the common right of all subjects. An imperial bank was instituted, Odessa was made a free port, the laws regarding debt and mortgages were amended, and by the ukase of 1818 peasants were permitted to carry on manufactures. Alexander sent expeditions around the world and made treaties with the United States, Spain, Brazil, and Turkey. Settlements were established on the northwestern coast of America, but the enunciation of the Monroe Doctrine in 1823 checked the Russian advance in the last direction. The new Ministry of Public Instruction meant much for the Empire. There had been but three universities in Russia—Moscow, Vilna, and Dorpat. These were strengthened and three others were founded at St. Petersburg, Kharkov, and Kazan. Literary and scientific bodies were established or encouraged, and the reign became noted for the aid lent to the sciences and arts by the Emperor and the wealthy nobility.

The foreign policy of Alexander was marked, like his internal policy, by plans outrunning performance. He at first stood as an advocate of peace. He endeavored to obtain from Napoleon just compensation for the German States; but, becoming convinced of Napoleon's bad faith, he joined the coalition of 1805. He was the ally of Prussia against Napoleon in the campaign of 1806, carrying on wars at the same time with Persia and Turkey. His forces fought an indecisive battle at Eylau in February, 1807, and were totally defeated at Friedland in the following June. In July, 1807, Alexander signed the Treaty of Tilsit, in which he left Prussia to her fate. Dazzled by the genius of Napoleon and by his scheme for the division of the world into an Eastern and a Western Empire, Alexander joined the Continental System (q.v.), declared war on England (1808), and wrested Finland from Sweden. At Erfurt in the autumn of 1808 the two emperors met with great pomp, but the ill-assorted alliance soon lost force. The pressure of the Continental System on the material resources of Russia, the growth of the Napoleonic despotism, the existence and aggrandizement of the Duchy of Warsaw, were utterly opposed to Alexander's theories and to his sense of sound Russian policy. At length in 1812 a rupture ensued, and Napoleon's Grand Army entered Russia, only to be destroyed in the retreat from Moscow. Alexander threw himself into the struggle of Europe against the French Emperor and raised an army of nearly 900,000 men. He took part personally in the campaigns and was prominent in the negotiations at Vienna.

Here Alexander was at the height of his power. He alone of the allied sovereigns was a liberal, and it was largely owing to his influence that Switzerland received her autonomy and France her *Charta*. The Czar, however, had a weaker side; he was a religious fanatic who prayed with the Quakers on the one hand and joined in religious dances with the Raskolnicks on the other. This mysticism was skilfully played upon by Madame Krüdener, a divorcée, and under her influence Alexander instituted the Holy Alliance (q.v.). This was really a harmless thing, despite the furor which it caused; but not so the personality of the Czar, of whose mental vagaries it was a good expression. By 1820 Alexander had forgotten his liberalism. Kotzebue, his agent, was murdered in Germany, a regiment of the guard refused to parade, and

Metternich fanned the flames of suspicion. As a result the ardent young reformer was drawn into a reactionary course. He concurred in the Austrian policy of Metternich, and by repressing insurrection in Europe assisted in crushing the political progress of the nations. The spread of education and liberal ideas, and the disorder of the finances, due to Russia's active part in the Napoleonic wars, aroused popular discontent, which was put down by the censorship and police espionage. Alexander became morbid and embittered, and sought relief alternately in dissipation and in religious mysticism. Personal exposure during the inundation of St. Petersburg in 1824 undermined his health; the death of a favorite daughter and the discovery of a Russo-Polish conspiracy against the House of Romanoff aggravated his illness. With the Empress he sought rest in the Crimea, but was seized by an illness on the journey and died at Taganrog, Dec. 1, 1825.

Bibliography. Schnitzler, *Histoire intime de la Russie sous les empereurs Alexandre I et Nicolas I* (Paris, 1847); Bogdanovitch, *History of the Reign of Alexander I*, in Russian (St. Petersburg, 1869-71), the first four volumes of which are translated into French; Rabbe, *Histoire d'Alexandre I* (Paris, 1826); Schilder, *Emperor Alexander Ist* (St. Petersburg, 1905).

ALEXANDER II (?-c.242 B.C.). King of Epirus, son of Pyrrhus (q.v.) and of Lanassa, daughter of the Sicilian tyrant Agathocles (q.v.). He succeeded his father in 272 B.C. To avenge the death of Pyrrhus, slain while fighting against Antigonus Gonatas (q.v.), he seized Macedonia, the latter's kingdom. Soon afterward, however, he was deprived of both Macedonia and his own dominions by Demetrius, son of Antigonus (so Justinus: others call him brother of Antigonus), but recovered Epirus by the aid of the Acarnanians and Ætolians (Just., xxvi, 3; xxxviii, 1; and Plut., *Pyrrh.*, 9).

ALEXANDER II, NIKOLAYEVITCH (1818-81). Emperor of Russia from 1855 to 1881, son of Nicholas I. He was born April 29, 1818, and received a thorough education and military training. He traveled in Germany and in 1841 married Princess Maria of Hesse-Darmstadt. He also journeyed through Russia, Siberia, and the Caucasus and took a creditable part in the campaigns against the Tcherkesses. On succeeding to the throne during the Crimean War (March 2, 1855), he assured the foreign ambassadors that he would adhere to the policy of his uncle (Alexander I) and his father, but his desire was for an honorable peace. In March, 1856, he was compelled to sign the humiliating Treaty of Paris. Alexander had not been in sympathy with the reactionary course of his father. While not a liberal, or an idealist like the first Alexander, he represented the intelligent thought of Russia and believed that a transformation was needed to place it in the first rank among nations. He soon announced his intention to promote reforms, and he was encouraged in this by the shock which the Crimean War had given to the old corrupt officialism of the Empire. Two reform parties arose—one a liberal constitutional party, having its centre at St. Petersburg; the other an old Russian nationalist party, centring at Moscow. They were united only in enmity to the bureaucracy. In response to their wishes and his own convictions, Alexander relaxed the censorship of the press, permitted travel, exercised

a close control over officials, recalled many who had been exiled to Siberia during the previous reign, extended education, and without instituting radical changes in the machinery of the government greatly widened the liberty of his subjects.

His best-known administrative act was the emancipation of the serfs. With this, of necessity, went a reform in the system of land tenure. Nearly all of Russia was held in large estates, worked by serfs who were nominally attached to the land, but were in fact almost as much at the disposal of their masters as if they had been slaves. Nine-tenths of the arable land of Russia was thus held by the imperial family and about 100,000 noble families. Beginning in 1858 by freeing the serfs on the estates of the imperial family, the Czar completed the emancipation by the ukase of March 3, 1861. Serfs who had been domestic servants, not attached to the land, became free without right to property. Those who had been attached to the land were enabled by a State loan, payable 6 per cent annually for 49 years, to purchase the interest of the former landlords in a certain share of the land. The freedmen thus became peasant proprietors, the land being held by the *mirs*, or village communities, which could assign it to the members. Police authority was put in the hands of the communal assemblies, and larger powers of taxation, administration, and police were vested in district and provincial councils. This reform, excellent in theory, increased the burdens of the peasantry. The village community became responsible for a heavy redemption tax from three to six times as high as all possible income that could be derived from the land. It could be paid in one way only—by the labor of those persons in the village community who worked outside as farm hands, factory laborers, etc. The peasant must not leave his commune without a pass; he must return when summoned—for his commune was responsible for this huge additional tax levied to pay interest on loans that went into the pockets of the nobility as ready cash. The peasant became poorer than ever before, and the foundations were thus laid for the agrarian crises of the early twentieth century.

The Emperor also established a regular system of courts. Public schools were founded after the model of western Europe, and scientific schools were erected in addition to those devoted to the regular classical training. The army, which in the Crimean War had so disappointed Nicholas I, was reorganized on the Prussian plan. While Alexander went thus far with the liberals, the Pan-Slavism of the Nationalists found equal sympathy with him. He said to the Polish deputies: "Embrace the union with Russia and abandon all thoughts of independence, now and for evermore impossible. All that my father did was rightly done. My reign shall be a continuation of his." The Polish national movement, culminating in the insurrection of 1863, was severely repressed, and a relentless process of Russification was instituted under Michael Muravieff. Since that time Poland has been under what is practically martial law. After 1863 there was a gradual return to absolutism in Russia, and many of the liberties that had been granted were withdrawn or modified, the Czar falling more under the influence of the conservative Nationalist party, led by Katkoff, the Moscow editor. For a few years

the liberals contented themselves with criticism of the conservative position and legal attempts to restore their influence. Then began the revolutionary movement, which finally developed in the hands of a few violent spirits into terrorism after 1875. (See NIHILISM.) The socialism of Marx and Proudhon had by this time been brought in from western Europe.

Between 1868 and 1881 the armies of Alexander were advancing the Russian frontiers in Central Asia. In 1868 Samarkand was occupied; in 1873 the Khan of Khiva was reduced to vassalage; in 1876 Khokand was annexed; and in 1881, just before the assassination of the Emperor, Geok-Tepe, the stronghold of the Teke Turkomans, was taken. The vigorous policy adopted after 1870 brought on a war with Turkey in 1877-78, in which the Russian standards were carried almost to Constantinople. This war appealed to the chivalric spirit of Alexander, who wished to be known as the Liberator Czar, because it was in a sense a crusade in behalf of the oppressed Christian peoples of the Balkans. The hopes of a Russian hegemony in the Balkan Peninsula, entertained by the Pan-Slavists, were overthrown, however, at the Congress of Berlin (q.v.).

The existence of the liberal and reactionary parties side by side in Russia explains some of the inconsistencies in Alexander's character. It is because of these opposing influences, both patriotic, that progressive and oppressive measures were often simultaneously enacted. Personally, Alexander seems to have tended always to the liberal side, although somewhat embittered by the spread of the revolutionary agitation. His life, during the years 1879-81, was never safe from the conspiracies of the extreme revolutionists, who pursued him with a remarkable persistence of hatred. After the terrible explosion of 1880, in the Winter Palace, Alexander gave General Loris-Melikoff, a distinguished officer of liberal tendencies, an extraordinary dictatorial commission for six months, and it is said, that, under Loris-Melikoff's advice, he was considering the question of the promulgation of a constitution by ukase when he was assassinated in St. Petersburg by the explosion of a bomb while driving from the parade to the Winter Palace on Sunday, March 13, 1881. He was succeeded by his son, Alexander III.

Consult: Haumant, in Lavissee, et Rambaud, *Histoire générale*, vol. xi (Paris, 1900); Cardonne, *L'empereur Alexandre II* (Paris, 1883); Laferté (pseudonym of the Princess Dolgorouki), *Alexandre II, Détails inédits sur sa vie intime et sa mort* (Basel, 1882); Sinkhovitch, *Die Bauernbefreiung in Russland* (Jena, 1908), and Roux, *Alexandre II, Gortchakoff et Napoléon III* (Paris, 1913).

ALEXANDER II (1198-1249). King of Scotland. He succeeded his father, William the Lion, in 1214. He early displayed that wisdom and strength of character by which he won the appellation of "the Peaceful," and in virtue of which he holds so high a place in history among Scottish kings. In 1214 he joined the English barons who had combined to resist the tyranny of King John and secured the Magna Charta. This drew down upon him and his kingdom the papal excommunication; but the ban was removed, and the liberties of the Scottish church were confirmed. On the accession of Henry III to the English throne, Alexander brought the feuds of the two nations to a temporary close

by a treaty of peace (1217), and in 1221 he married Henry's eldest sister, the Princess Joan. The alliance thus established was broken after the death, without issue, of Queen Joan (1238), and the second marriage of Alexander with the daughter of a nobleman of France. In 1244 Henry marched against Scotland to compel Alexander's homage, but peace was concluded without an appeal to arms. While engaged in one of those warlike expeditions which the turbulence of his subjects so frequently rendered necessary, Alexander died of fever at Kerrera, a small island in the Bay of Oban.

ALEXANDER III, ALEXANDROVITCH (1845-94). Emperor of Russia from 1881 to 1894. He was born March 10, 1845, and he succeeded his father, March 13, 1881, but was not crowned until May 27, 1883, after the panic caused by the assassination of Alexander II had somewhat subsided. Alexander at first expressed his intention of following out the constitutional reforms of Loris-Melikoff, but he fell under the influence of the leaders of the old Russian Nationalist party, Katkoff, Pobiedonostseff, and Ignatieff, and restored the autocratic system of Nicholas so far as internal affairs were concerned. He pursued a stern policy of repression with regard to the political agitation which had caused the violent death of his father. The Terrorists were practically suppressed, a rigid censorship was reestablished, education was restricted, and dissenting religions were persecuted. As a result of the persecution, Jews in great numbers emigrated from the country, chiefly to the United States and South Africa. The policy of the Russification of the non-Russian provinces, begun by Nicholas I and discontinued for a time by Alexander II, was resumed with new vigor. The finances of the Empire were well managed. The revenue was largely increased, and a protective tariff was used as a part of the system to strengthen Russian nationality.

In his foreign policy Alexander did not follow the example of Nicholas. His influence was directed toward the preservation of peace. Russia and France were drawn into closer and closer connection in opposition to the Triple Alliance of Germany, Austria, and Italy. Alexander continued the policy of interference in the affairs of the Balkan States, especially Bulgaria, bitterly resenting that spirit of nationalism which his father had regarded as ingratitude toward Russia. He endeavored, not very successfully, to counteract Austrian influence among the Balkan peoples. In Asia he continued to round out the frontier and strengthen Russia's hold on its provinces. Several attempts were made to assassinate him, but they lacked the completeness of preparation and the venomous persistence which had pursued his father. Alexander married Dagmar (re-baptized into the Greek church as Maria Feodorovna), daughter of Christian IX of Denmark, Nov. 9, 1863. He died Nov. 1, 1894; and was succeeded by his son, Nicholas II.

Consult: Andrews, *Historical Development of Modern Europe*, vol. ii (New York, 1898); Scignobos, *Political History of Modern Europe* (New York, 1900); Samson-Himmelstierna, *Russland unter Alexander III mit Rückblicken auf die jüngste Vergangenheit* (Leipzig, 1891), translated by Morrison, *Russia under Alexander III and in the Preceding Period* (New York, 1893); Lowe, C., *Alexander III of Russia* (Lon-

don, 1895). This reign has claimed very little special attention from historians.

ALEXANDER III (1241-85). King of Scotland. He succeeded his father, Alexander II, in 1249, and two years afterward he married the Princess Margaret, eldest daughter of Henry III of England. Alexander's minority enabled Henry to prosecute successfully for some time his schemes for obtaining entire control over the Scottish kingdom; but long before he reached manhood, Alexander displayed so much energy and wisdom as to give assurance that when the administration of affairs should come under his personal direction it would be vain to think of reducing him to submission. Very shortly after he had come of age his energies were summoned to the defense of his kingdom against the formidable invasion of Hakon, King of Norway (1263), who claimed the sovereignty of the Western Isles. In attempting a landing at Largs, on the coast of Ayr, the Norwegian prince was unsuccessful, and, as his fleet had suffered from storms he was obliged to return home. Alexander, as the result of this failure of Hakon, secured the allegiance both of the Hebrides and of the Isle of Man. An alliance was formed between Scotland and Norway, and strengthened in 1281 by the marriage of Alexander's only daughter, Margaret, to Eric, King of Norway. This princess died in 1283, leaving an infant daughter, Margaret, commonly called "the Maid of Norway," whose untimely death, on her way to take possession of her throne, was the occasion of so many calamities to Scotland. During the concluding years of Alexander's reign the kingdom enjoyed a peace and prosperity which it did not taste again for many generations. The justice, liberality, and wisdom of the King endeared his memory to his subjects, while the misfortunes that followed his death heightened the national sense of his loss. His eldest son, Alexander, who had married the daughter of the Count of Flanders, died without issue in 1283. After the death of "the Maid," Alexander contracted a second marriage with Joleta, daughter of the Count of Dreux. He was killed by falling from his horse in 1285.

ALEXANDER, ABRAHAM (1718-86). An American legislator. He was born in North Carolina and in early life was a magistrate of Mecklenburg county, which he represented in the Colonial Legislature until 1775. In this year he served as chairman of the county convention, which, on May 31, passed a series of resolutions, later distorted into the famous "Mecklenburg Declaration of Independence" (q.v.).

ALEXANDER, ARCHIBALD (1772-1851). An American Presbyterian clergyman. He was born in Augusta (now Rockbridge) Co., Va. He was self-educated and was led to religious study in the revival of 1789. He was licensed to preach in 1791 and spent several years as an itinerant missionary, and was president of Hampden-Sidney College, 1796-1801. In 1802 he married the daughter of Rev. Dr. Waddell, the blind preacher whose eloquence was eulogized by William Wirt. He was pastor of Pine Street Presbyterian Church, Philadelphia, from 1807 to 1812, and was at the organization of the theological seminary of the Presbyterian church at Princeton, N. J. He was unanimously chosen professor of theology, the position which he maintained with eminent success until his death there, Oct. 22,

1851. His best-known work is *A Brief Outline of the Evidences of the Christian Religion* (Princeton, 1823), which has been translated into many languages and is a text-book in colleges. He wrote also *The Canon of the Old and New Testaments Ascertained* (1826); *The Log College* (1845); and *Moral Science*, which was published after his death (1852). Consult, for his life, J. W. Alexander (New York, 1854).

ALEXANDER, BARTON STONE (1819-78). An American soldier, born in Kentucky. He graduated at West Point and entered the engineer corps in 1842. He was engaged in engineering work from 1842 to 1859, superintending the construction of the military asylum at Washington, the marine hospital at Chelsea, Mass., and the Minot Ledge lighthouse, and in 1860 was employed in the construction of defenses around Washington. Subsequently he served with gallantry in the Manassas campaign and in the battle of Bull Run, was Consulting Engineer on the staff of General Sheridan (1864), and in March, 1865, was brevetted Brigadier-General. In 1865-67 he was in charge of public works in Maine. He became senior engineer, with the rank of Lieutenant-Colonel, in 1867, and he was a member of the Pacific board of engineers for fortifications from that time until his death.

ALEXANDER, BOYD (1873-1910). An English naturalist and explorer. Educated at Radley College, he early enlisted in the militia battalion of the Rifle Brigade, and later served with the Gold Coast Constabulary and the regular Rifle Brigade. He led many journeys of exploration and scientific research in various parts of the world, including the Cape Verde islands, the Zambesi River, Fernando Po, and the Niger-to-Nile region. In 1909 he explored several islands in the Gulf of Guinea, and continuing on to the Kamerun country, made a special study of the craters of volcanic mountains. Among other contributions of his to science was the discovery of many new birds, when his party made the first ascent on record of Mount St. Isabel. He received a gold medal from the Royal Geographical Society of Antwerp in 1907, and a year later was made a gold medalist of the Royal Geographical Society of London. In May, 1910, while on a journey of exploration in the French Congo, Alexander was murdered by natives. His writings include the account of his African journeys, *From the Niger to the Nile* (2 vols., 1907); "Birds of Kent" in the *Victorian History of England*; and many papers in geographical journals. In 1912 *Boyd Alexander's Last Journey, with a Memoir by Herbert Alexander*, was published.

ALEXANDER, DE ALVA STANWOOD (1846-). An American public official and historian, born in Richmond, Me., and graduated from Bowdoin College in 1870. From 1862 to 1865 he served as a private in the Union army. Having studied law and been admitted to the bar, he practiced law in Indianapolis until 1881. In that year he was appointed an auditor in the United States Treasury, resuming the practice of law at Buffalo, N. Y., in 1885. From 1889 to 1893 he was United States Attorney for the northern district of New York, and from 1897 continuously to 1912 was a member of Congress. His defeat finally came in a general Republican overthrow in New York. He made an exhaustive study of New York politics, and his *Political History of the State of New York* (3 vols., 1906-09) is con-

sidered the final authority on this important subject. He became an overseer of Bowdoin College and received the degree of LL.D. from that institution.

ALEXANDER, EBEN (1851-1910). An American diplomat and educator, born in Knoxville, Tenn., and graduated from Yale College in 1873. Almost continuously throughout his life, after this date, he was identified with the University of North Carolina, as professor of ancient languages and later of Greek, and as dean of the faculty. One year (1885) he spent as chairman of the faculty of the University of Tennessee, and four (1893-97) as United States Minister to Greece, Servia, and Rumania. The Tennessee State Teachers' Association made him their president in 1886.

ALEXANDER, EDWARD PORTER (1835-1910). An American soldier and engineer. He was born at Washington, Ga., and graduated at the West Point Military Academy in 1857. After serving as an engineer in the United States army, he joined the Confederacy in 1861, and advanced to the rank of Chief of Ordnance and Chief Signal Officer in the Army of Northern Virginia (1861-62). In February, 1864, he was commissioned Brigadier-General. He was also Chief of Artillery in General Longstreet's corps, and served in that capacity in the battles of the Wilderness and Spottsylvania and at the siege of Petersburg. At the close of the war he was appointed professor of mathematics and engineering at the University of South Carolina, and four years afterward began his career as general manager and president of various Southern railroads. He was a government director of the Union Pacific Railroad from 1885 to 1887, and in 1901, as engineer arbitrator, took charge of the boundary survey between Costa Rica and Nicaragua. He wrote *Railway Practice* (1887), and *Military Memoirs of a Confederate* (1907; new ed., 1913).

ALEXANDER, FRANCIS. An early American portrait painter (1800-81). He was born in Windham Co., Conn., and was practically self-taught in his art. After practicing in Connecticut and at Providence, R. I., he was invited by Gilbert Stuart to settle at Boston, where he enjoyed great vogue as a portrait painter. He studied in Florence and Rome from 1831 to 1833, after which he returned to Boston. His last years were spent at Florence, where he died in 1881. He was of a very enterprising character, and it is related that when Dickens visited America in 1842, he appeared with the pilot who had come to guide the ship into the harbor and induced the novelist to sit to him for a portrait. His best-known portrait is that of Mrs. Fletcher Webster in the Boston Museum of Fine Arts. His art resembles that of the painters of the middle period of American painting, being classic in line and glossy in color. Consult Isham, *History of American Painting* (New York, 1905).

ALEXANDER, Sir GEORGE (1858-). An English actor and manager, whose full name is George Alexander Gibb Samson. He was born at Reading, June 19, 1858, and was educated at Clifton, Stirling, and Edinburgh. In 1881 he joined Irving's company at the Lyceum, where later he won particular successes as Faust (1886) and Macduff (1888). In the season of 1884-85 he accompanied Mr. Irving to America. Mr. Alexander began management in 1890 at the Avenue Theatre, but took the St. James Theatre

in the next year. He has produced more original plays by English authors than any other manager. Some of his notable productions have been *The Idler* (1891), *Lady Windermere's Fan* (1892), *The Second Mrs. Tanqueray* (1893), *The Prisoner of Zenda* (1896), *In Days of Old* (1899), and Stephen Phillips's *Paolo and Francesca* (1901), besides several successful Shakespearian productions, including *As You Like It* (1896), and *Much Ado About Nothing* (1898). He played in *The Builder of Bridges* before H. M. King Edward, December, 1908, and in *Money* at the Royal Command performance, May, 1911, given on the occasion of the State visit of the German Emperor. He became president of the Royal General Theatrical Fund.

ALEXANDER, GROSS (1852-1915). An American clergyman and writer, born in Scottsville, Ky. Graduating from the University of Louisville in 1871, he was from then until 1873 a tutor in that institution. Following two years as professor of Latin and Greek at Warren College, Ky., he entered the Drew Theological Seminary, from which he graduated in 1877. Successively he filled pastorates at Lake Mohonk, N. Y. (1875-76); at New Brighton, Staten Island (1877); and in Kentucky (1877-84). Having occupied during the next 17 years the chair of New Testament Greek and exegesis at Vanderbilt University, he was appointed presiding elder of the Louisville conference (1902). In 1906 he became editor of the *Methodist Review* and book editor of the Methodist Church, South. In addition to many essays and articles on theological subjects, Dr. Alexander's writings include: *History of the Methodist Episcopal Church, South*, in the *American Church History Series* (1894); *The Beginnings of Methodism in the South* (1897); *The Son of Man: Studies in his Life and Teaching* (1899); *Commentary on Colossians and Ephesians* (1909); *New Study of the Resurrection of Jesus* (1913).

ALEXANDER, HARTLEY BURR (1875-). An American scholar and educator, born in Lincoln, Neb. He graduated from the University of Nebraska in 1897; was a fellow at the University of Pennsylvania (1898-1900); a fellow at Columbia University (1900-01); and from the last-named institution received the Ph.D. degree in 1901. He was an editor and contributor on the staff of the *NEW INTERNATIONAL ENCYCLOPEDIA* in 1903; for the five succeeding years was a member of the staff of Webster's Dictionary; and in 1908 became professor of philosophy at the University of Nebraska. He was made a member of several learned societies. His published writings include: *The Problem of Metaphysics* (1902); *Poetry and the Individual* (1906); *The Mid-Earth Life* (1907); *Odes on the Generations of Man* (1910); *The Religious Spirit of the American Indian* (1910).

ALEXANDER, JAMES (c.1690-1756). A colonial lawyer. He was born in Scotland, emigrated to New Jersey in 1715, practiced law, and was temporarily disbarred for defending John Peter Zenger (q.v.), when he was accused of sedition in 1733. He held many responsible public offices, including those of Surveyor-General of New York and New Jersey; member of the Legislature and Council of the province of New York; Attorney-General of the province from 1721 to 1723, and later its Secretary. He was one of the founders of the American Philosophical Society. His son was William Alexander (q.v.).

ALEXANDER, Sir JAMES EDWARD (1803-

85). A Scotch officer, traveler, and author. He served in the war against Burma (1825) and in various other campaigns. He traveled in Persia and South America, and in 1836-37 conducted an exploring expedition into Africa. He retired in 1877, and the honorary rank of General was given to him in 1881. His works include: *Travels through Russia and the Crimea* (1830); *Transatlantic Sketches* (1833); *Expedition of Discovery into the Interior of Africa* (1838); *L'Acadie* (1849); *Incidents of the Last Maori War* (1863); *Bushfighting* (1873).

ALEXANDER, JAMES WADDELL (1804-59). An American clergyman, a son of Dr. Archibald Alexander. He graduated at Princeton College in 1820 and afterward was a tutor there. He was installed pastor of the Presbyterian church at Charlotte Court House, Va., in 1827, and of the First Church of Trenton, N. J., in 1829. He was professor of Belles Lettres and Latin in Princeton College, 1833-44, pastor of the Duane Street Church, New York, 1844-49, and professor of ecclesiastical history, church government, and sacred rhetoric in Princeton Seminary, 1849-51. When the Duane Street Church in New York was reorganized as the Fifth Avenue Church, he again became its pastor and continued to be until his death. Among his many works are volumes of sermons; *Plain Words to a Young Communicant* (1854), *The American Mechanic and Workingman* (2 vols., 1847), and a biography of his father (1854).

ALEXANDER, JOHN HENRY (1812-67). An American scientist, born at Annapolis, Md., and educated at St. John's College there. He was connected with the Maryland geological survey and did much toward opening the coal fields of that State. He published in 1840, a *History of the Metallurgy of Iron*. He was active in establishing a uniform standard of weights and measures throughout the United States and published a *Universal Dictionary of Weights and Measures* (1850). He was professor of physics for two years in St. John's College, Md., and held a similar position at the University of Pennsylvania. In 1857 he was chosen delegate from the United States government to the British commission on decimal coinage. He was recommended as director of the mint, but died before appointment. Consult: Hilgard, *Biographical Memoir of John H. Alexander* (Washington, 1877); National Academy of Sciences, *Biographical Memoirs*, vol. i (Washington, 1866).

ALEXANDER, JOHN WHITE (1856-1915). An American portrait, figure, and decorative painter, a leading figure in contemporary art. He was born in 1856 in Allegheny City, now a part of Pittsburgh, Pa. Orphaned in infancy, he was reared by his grandparents and at the age of 12 became a telegraph boy in Pittsburgh. His talents in drawing attracted the attention of one of his employers, who assisted him to develop them. At 18 he became an apprentice in the art department of *Harper's Weekly*, at the same time that Abbey, Pennell, Pyle, and other celebrated illustrators labored there. After three years' apprenticeship he went to Munich (1877). He studied for a short time at the Royal Academy, but owing to lack of funds he removed to the village of Polling, Bavaria, and worked with Frank Duveneck. He went with Duveneck to Venice, where he profited by the advice of Whistler, and then continued his studies in Florence, Holland, and Paris. In 1881 he returned to New York and speedily achieved great

success in portraiture, numbering among his sitters Oliver Wendell Holmes, John Burroughs, Walt Whitman, whose powerful characteristic portrait is in the Metropolitan Museum of Art, New York City, Henry G. Marquand, R. A. L. Stevenson, and President McCosh of Princeton University. His first exhibition in the Paris Salon of 1893 was a brilliant success and was followed by his immediate election to the Société Nationale des Beaux Arts. For many years he divided his time between Paris and New York, where he later resided. In 1901 he was named Chevalier of the Legion of Honor, and in 1902 member of the National Academy of Design, New York, becoming president in 1909. He was also LL.D. of Princeton and a member of the American Academy of Arts and Letters. Among the gold medals received by him were those of the Paris Exposition (1900) and the World's Fair at St. Louis (1904). He was an honorary member of several European societies, including the Secessionists of Munich and Vienna.

Among his principal paintings are a portrait of Fritz Thaulow (1894), Wilstach collection, Philadelphia; "The Pot of Basil" (1897), Boston Museum; "Pandora" (1898); "In the Café," Philadelphia Academy; "La Femme Rose," Carnegie Institute, Pittsburgh; "The Green Bow," Luxembourg, Paris; "Two Sisters"; the portraits of Rodin (1900), Mrs. Alexander, Worthington Whitredge (Century Club, New York), and Mrs. Wheaton. His portrait of President Loubet hangs in the Elysée Palace, Paris. The Metropolitan Museum possesses his "Study in Black and Green" and "The Engagement Ring" (1912), and the Art School of Yale University his portrait of John F. Weir (1913). His mural paintings include six large canvases representing the "Evolution of the Book" in the Congressional Library, Washington (1896-97); and a splendid series of many panels covering the walls of the three stories of the entrance hall to the Art Museum of the Carnegie Institute, Pittsburgh. The general subject is the "Apotheosis of Pittsburgh," which is represented in the central panel as a mailed knight, saluted by panel after panel of workmen and by the nations of the earth. Alexander's original and highly individual art is based upon a very personal interpretation of humanity. He is especially known as a subtle portrayer of modern woman in her graceful poses and movements, but his strong and characteristic men are no less effective, and he has painted landscapes of great charm and individuality. His very modern technical methods have caused him to be called the most Parisian of American painters. By the use of a very coarse canvas and thin pigments he achieves rapid execution, direct presentation, and great carrying power. His color is fluid and pleasing, with striking light and shade effects. But though always able, his work is not uniformly excellent. Consult *The Studio*, vol. xx (1900); *International Studio*, vols. xxxiv (1908), xlii (1911); Isham, *History of American Painting* (New York, 1905).

ALEXANDER, JOSEPH ADDISON (1809-60). Eminent American biblical scholar, born in Philadelphia, a son of Dr. Archibald Alexander. He was a pupil of his father, graduated at Princeton College in 1826, was adjunct professor there of ancient languages and literature from 1830 to 1833, instructor, associate professor, and professor of Oriental and biblical literature in Princeton Seminary from 1833 to 1850; of

Church history and government from 1851 to 1860, of New Testament literature and biblical Greek in 1859 and 1860. He wrote commentaries on *The Psalms* (3 vols., 1850); *Isaiah* (2 vols., 1846-47); *Matthew* (1860); *Mark* (1858); *Acts* (1856), all drawn largely from German sources. He also published *Sermons* (2 vols., 1860). Consult his *Life* by H. C. Alexander (2 vols., New York, 1869).

ALEXANDER, LEGEND OF. A famous but largely fictitious account of the adventures of Alexander the Great, which was the basis of many romantic works in the Middle Ages. It originated probably at Alexandria, in Egypt. The historical narrative of Callisthenes (q.v.) having been lost, there appeared about 200 A.D. under his name (sometimes referred to as the pseudo-Callisthenes) a Greek story, which represented Alexander as really the son of Nectanebus, the last King of Egypt, and credited him with a fabulous series of exploits in connection with his actual conquests. This compendium of legendary lore on the Macedonian conqueror was translated into Latin early in the fourth century by Julius Valerius. His version was subsequently abridged, particularly in the account called *Historia de Præliis*, by Archbishop Leo, about the end of the tenth century. Besides these there were the so-called "Letter of Alexander to Aristotle" on the wonders of India, the "Correspondence" of Alexander and Dindimus, King of the Brahmans, a brief rhythmic abecedary poem on Alexander, and the *Iter ad Paradisum*. About the twelfth century, the period of the *Chansons de geste* of the cycle of Charlemagne, several French poems were built upon the Alexander Legend; one of the earliest was that of Alberic of Besançon, written in ten syllable lines in the Provençal language, of which only the beginning is extant; the best known is the great *Chanson d'Alexandre*, by Lambert li Tors and Alexandre de Bernai. The twelve-syllable lines in which this was written gave its name to the Alexandrine verse. The Alexander of the Middle Ages was essentially a mediæval knight. He became one of the "nine worthies," and one of the four "kings" in the game of cards. More or less original versions of the legend appear in poems of nearly every European country, and even in the Orient, where the story of the pseudo-Callisthenes was rendered into Syrian and Armenian as early as the fifth century. Some of the Slavic forms of the tale go back through Byzantium to this eastern version. Of those in western Europe, most notable after the French poems are perhaps those in German by Lamprecht, who translated that of Alberic, and by Rudolph of Montfort, of the thirteenth century. In Spain the *libro de Alixandre*, one of the oldest monuments of Spanish poetry, has been attributed to Juan Lorenzo Segura of Astorga, but he was probably the copyist only. Though the author reveals his acquaintance with the French poems, his version is original in many ways. Among the numerous English versions of this legend the earliest is probably the *Lyfe of Alisaunder* in verse, composed about 1330. It was published in H. Weber's *Metrical Romances* (vol. i, 1810). Thomas (or Eustache) of Kent's abridged version of Valerius and of the French romances, was originally written in the Anglo-Norman, under the title *Le roman de toute chevaleric*. It was translated into English under the title *King Alisaunder*. Consult: Paul Meyer, *Alexandre le Grand, histoire de la légende*

d'Alexandre dans les pays romains (Paris, 1886); Spiegel, *Die Alexandersage bei den Orientalen* (Leipzig, 1851); Ausfeld, *Der griechische Alexanderroman* (Leipzig, 1907); Pfister, *Kleine Texte zum Alexanderroman* (Heidelberg, 1910); Morel-Fatio, *El Libro de Alixandre* (Dresden, 1906); Roskopf, *Editio princeps des mittel-englischen Cassamus* (Erlangen, 1911).

ALEXANDER, MRS. See HECTOR, ANNIE.

ALEXANDER, SAMUEL (1859—). An English philosopher and educator, born at Sydney, N. S. W. He was educated at the University of Melbourne and at Oxford and was Fellow of Lincoln College from 1882 to 1893. In 1893 he was appointed to the chair of philosophy in Owens College (Victoria University). He was president of the Aristotelian Society from 1908 to 1911. In addition to frequent important contributions to the *International Journal of Ethics*, to *Mind*, and other periodicals, he wrote *Moral Order and Progress* (1889); *Locke* (1908).

ALEXANDER, STEPHEN (1806-83). An American astronomer. He was born at Schenectady, N. Y., and was educated at Union College and Princeton Theological Seminary. He remained at Princeton, becoming adjunct professor of mathematics (1834-45), professor of mathematics (1845-54), and professor of astronomy from 1840 until his retirement in 1878 as professor emeritus. During a part of this time he was professor of natural philosophy. In 1860 he was at the head of the expedition to Labrador to observe the solar eclipse of July 18, and was sent on a similar mission in 1869. He was the author of many scientific papers, chiefly astronomical, such as *Physical Phenomena Attendant upon Solar Eclipses* (1843), *Origin of the Forms and Present Condition of Some of the Clusters of Stars* (1850), and *Harmonies in the Arrangement of the Solar System*. He also wrote on the *Fundamental Principles of Mathematics*. Consult "Memoir of Stephen Alexander" (*National Academy of Sciences, Biographical Memoirs*, 1886, vol. ii).

ALEXANDER THE GREAT (365-323 B.C.). King of Macedonia and conqueror of the eastern world, son of Philip II of Macedon (q.v.) and of Olympias, an Epirot princess. At Alexander's birth his father had already established his position as King of Macedonia, had made great progress in developing his army, and had begun the extension of his kingdom to the eastward, so that he possessed the rich gold mines in Mount Pangæus. The yearly revenue of 1000 talents from these mines made feasible his policy of expansion. Though a thoroughgoing Macedonian, Philip was still possessed of genuine Greek culture; doubtless, while a hostage at Thebes, he had learned much beside military and political wisdom. He chose Aristotle as his son's tutor. How far the teacher influenced the pupil we cannot determine; he undoubtedly gave him a thorough training in rhetoric and literature—he may have inspired that love for the Hellenic past which characterized Alexander later; but it is improbable that Alexander's far-reaching ambition for conquest gained the sympathy of Aristotle. In the summer of 336 B.C. Philip was assassinated; that the murder was instigated by Olympias, whom Philip had put away in favor of the niece of his general Attalus, there is little doubt. Philip had gained a remarkable position for a Greek ruler. He had extended his empire eastward, had made Thrace tributary, and had tried to capture Byzantium.

Thessaly was dependent on him; he had gained a place in the Amphictyonic Council; and, by his victory at Chæronea (August, 338), he had made himself the head of all Greece, a position formally recognized by the Congress of States at Corinth in the following year. The greatest legacy, however, which he left his son was the large conception of a Panhellenic empire.

At his accession Alexander found himself surrounded by enemies at home and threatened by dangers abroad. The subject States were planning to revolt, and Greece hated the Macedonian hegemony. But the hands of assassins cleared away his domestic enemies. With the greatest speed he descended to the south; before the summer closed he had reestablished Macedonia's position in Lower Greece and had been elected by the Congress at Corinth to his father's place as General of the Greeks against the Persians (336). The next year he speedily carried out a successful campaign against the defecting Thracians, and penetrated to the Danube. On his return he crushed in a single week the threatening Illyrians and then hurried into Greece, for certain States had been negotiating with Persia. When a report spread that Alexander was dead, the Thebans sought to throw off the Macedonian yoke. Alexander hastened from Illyria to Thebes, defeated the Thebans, and captured the city. In September, in accordance with a vote of the Congress of Corinth, he razed Thebes to the ground, sparing only the house of the poet Pindar. This prompt action ended all positive resistance in Greece and left Alexander free to enter on his eastern campaigns.

At the beginning of 334 he crossed to Asia Minor, where his generals had already gained a foothold. To secure Macedonia and Greece he had been forced to leave behind a considerable portion of his army; only 30,000 foot and 5000 horse, it is said, followed him, yet these were undoubtedly skilled veterans. His ships numbered but 160, which were so inadequate to combat the 400 galleys of the Persians that he soon disbanded them. After visiting the site of ancient Troy and making offerings there, he advanced in early summer to meet a Persian force at the river Granicus. He was victorious and then proceeded to the conquest of Asia Minor. The prompt surrender of Sardis, without resistance, gave him the satrapy of Lydia, and Miletus soon fell. Halicarnassus resisted stubbornly for a time; but finally the defenders withdrew after firing the city. At the close of the summer's campaign Alexander marched into Lycia, which yielded at once, and then advanced through Pamphylia and Pisidia to Celænæ and Gordium, where with a stroke of his sword he loosed the famous knot and entitled himself to become the lord of Asia. See GORDIAN KNOT.

Gordium was the mustering point for the year 333. Alexander led his reassembled army first into Cappadocia, where he received the submission of Paphlagonia, and then advanced to the "Cilician Gates." By a ruse he caused the hostile force here to retire and entered Tarsus unopposed. All Cilicia was soon secured. Thus in less than two summers the greater part of Asia Minor had been won and Alexander had taken the first step in his plan of conquest. The next was to advance by way of Syria to the subjugation of Egypt; this accomplished, Alexander could proceed against Babylon and Susa. But the Great King had assembled a vast

host to check the invader. Battle was joined in the little plain of Issus, where the enormous numbers of the Orientals could not be employed to advantage. The day was decided by Alexander's attack on that part of the line where Darius was in his war-chariot (this scene is portrayed in a famous Mosaic, now in the Museo Nazionale at Naples). The Great King turned and fled, while the Greeks drove all before them. The mother, wife, and children of Darius fell into Alexander's hands, but were treated by him with the respect due royalty. While this victory at Issus opened the way to Syria and Egypt, it was far more valuable to Alexander in the prestige it gave him. Darius himself wrote to Alexander, complaining that Alexander had been an unprovoked aggressor, begging for the return of the royal captives, and proposing to make a treaty of alliance. To Alexander the letter seemed to have, after all, a tone of condescension, and his reply was a stern command to Darius, his defeated foe and subject, to come to him and offer submission.

Alexander was not lured aside to pursue and crush Darius, but moved against Syria, and against the Phœnician towns, especially Tyre and Sidon. Sidon had been reduced by Persia a few years before, so that she welcomed Persia's new foe, who accepted her submission and restored her former territory and rights. The Macedonian army reached Tyre at the end of 333; when this city declined to receive Alexander, it was at once invested. The siege lasted from January to the end of July, 332; again and again the attackers were beaten back, but at last the city fell before a concerted onslaught. Alexander now could advance on Egypt, since Syria was secure. Gaza alone offered stubborn resistance, but succumbed after a siege of some weeks.

About November, 332, Egypt, now wholly cut off from Persia, was reached, and the Persian satrap promptly yielded. At Memphis Alexander was crowned king; he then sailed down the Nile to Canopus and founded a new city bearing his name. (See ALEXANDRIA.) This he intended to become the new capital of Egypt and to supplant Tyre as the emporium of trade. History has shown how wisely the site was chosen and the city planned, but the most significant immediate result was the transfer of commerce from the Phœnicians to the Greeks. Presently Cyrene sent Alexander her submission, so that his influence extended to Carthaginian territory. Early in 331 he visited the shrine of Ammon-Rê in the Libyan desert (see AMMON), where tradition says the god acknowledged him as his son, thereby giving him divine title to succeed the Pharaohs.

The following spring Alexander returned to Tyre, where he was occupied with questions of organization. Then he started for Babylon with 40,000 foot and 7000 horse. Early in August he reached the Euphrates, then advanced across northern Mesopotamia, and marched down the banks of the Tigris. At last he heard that Darius was encamped in a plain near Gaugamela with an enormous host, which tradition reports numbered 1,000,000 infantry and 40,000 horse. October 1, 331, the armies engaged. At certain points the Greeks were hard pressed, but at a critical moment Alexander broke the Persian centre, whereupon Darius fled as he had done at Issus; finally the Macedonians won at every point. Darius was pursued to

Arbela (q.v.), where his chariot and weapons were found, but the King escaped on horse to the Median highlands. Babylon opened its gates to the victor, and there the army rested. Susa, with its enormous treasures, soon fell into Alexander's hands.

It was of great importance that Persis and its capital be secured at once, so that although the season was mid-winter Alexander pressed on over the Uxian Pass. He stormed the almost impregnable "Persian Gates" by a surprise march over snow-covered mountains, and soon was at Persepolis and the royal palaces, whose ruins still give some idea of their magnificence. No less than 120,000 talents were found in the treasuries, together with other spoil. At Pasargadæ also much treasure was taken. About four months, apparently from January to April, 330, were spent at the ancient palace of the Achæmenian kings. (See ACHÆMENES.) During this time the district of Caramania yielded. Then Alexander started in pursuit of Darius, who, he had heard, was at Ecbatana with an army; but on reaching the city he found that Darius had fled eastward. Alexander soon pressed on, but after great efforts secured only the dead body of his enemy, who had been treacherously slain by his followers. One of the murderers had fled to Hyrcania on the south shore of the Caspian, and Alexander felt it necessary to secure this district before following the other chief assassin into remoter Bactria. The Persians who had retreated into Hyrcania yielded when Alexander appeared, and left him free to advance into northern Areia, where the Persian satrap promptly surrendered. It is not possible here to give in detail the successive steps of Alexander's new advance; by midsummer, 328, he was master of Drangiana, Seistan, Gedrosia, and Arachosia, satrapies corresponding roughly to modern Afghanistan and Baluchistan; he had annexed Bactria and Sogdiana at the north, and had fixed the limits of his conquests in this direction by founding Alexandria Eschate (Khodjend) near the pass over the Tian-shan Mountains. The following year was spent in putting down uprisings and in firmly establishing his power.

Alexander then turned to the conquest of India; one purpose of this, no doubt, was to secure control of the valuable trade-routes to India. He came back to Afghanistan and at Nicæa (Kabul?) prepared for the new campaign. The advance must have been made by the Khyber Pass. The winter of 327-326 was spent in subduing the hill-men and the inhabitants of the river valleys along the western base of the Himalayas. In the spring he marched to the Hydaspes, receiving the submission of the native princes on the way. At the river he was opposed by King Porus, but by stratagem and skill the Indian monarch was defeated. Alexander gave him back his kingdom much increased, thereby securing a buffer State on his own borders, for apparently he intended the Indus to be the eastern boundary of his Empire. He then continued to the south-east until he reached the river Hyphasis. Here the Macedonians refused to go farther, and unwillingly Alexander was obliged to turn back when, as he thought, he was near the end of the world. He returned to the Hydaspes; then advanced southward, subduing the tribes of the Lower Punjab, and finally reached the Indian Ocean in the early summer of 325. Part of his



ALEXANDER THE GREAT
MARBLE BUST IN THE BERLIN MUSEUM

force had already been dispatched to reduce a revolt in Arachosia. Alexander himself started in early autumn to return to Babylon across the desert of Mekran, while his fleet was to find a seaway between the East and the West. For two months he and his army struggled across the desert, suffering from heat, hunger and thirst. The losses were very great, so that only a portion of those who started reached the capital of Gedrosia. After a rest, Alexander pressed on to Kirman, where he met his Admiral, Nearchus, who in spite of great hardships had made the voyage from India. He was ordered to sail along the Persian Gulf and up the river Pasitigris to Susa, whither Alexander proceeded overland. Upon his arrival his first task was the correction and punishment of misrule on the part of his satraps, many of whom, believing he would never return, had oppressed their provinces and had planned to set up independent kingdoms. When the abuses had been corrected and the guilty punished, Alexander set about the further amalgamation of the Greeks and the Orientals. He had already founded Greek cities wherever he had been; he now encouraged intermarriage and set the example himself by taking to wife Statira, the daughter of Darius. He had already married Roxana (q.v.), a Bactrian princess; he thus followed the polygamous custom of Persia. Many of his officers chose Persian consorts. Furthermore he planned to admit Orientals and Greeks to equality in military service, and established military schools in the various provinces, much against his veterans' wishes.

The greater part of the year 324 was spent in a survey of the Persian Gulf and in general organization at Ecbatana. In the winter Alexander returned to Babylon, where embassies from the remotest west came to seek his friendship. But his mind was now busy with plans for building up a great sea trade with India by way of the Red Sea, the Persian Gulf, and the Indian Ocean. Babylon was to become a great seaport. With these things in view he planned a naval expedition to circumnavigate and conquer Arabia. Before this could start, Alexander fell ill of a fever following a carouse, and in 12 days he lay dead (June, 323).

The rapidity and brilliancy of Alexander's military operations have generally obscured his preëminent qualities as a statesman. He inherited from his father the concept of a great empire, and he had the genius to lay the foundations of a unified realm surpassing the dreams of Philip. Throughout the course of his conquest he organized the rule of his satrapies so that the power was divided and revolt made difficult. Seeing that the ruler of the vast realm which he was conquering should adopt much of the native custom, he assumed not a little Oriental state, which undoubtedly strengthened his position in spite of the disapproval it aroused among his Greek followers; and he took many wise measures to amalgamate the East and the West. His plans for trade development would have had great effect on social and economic conditions if he could have carried them out. The unified Empire which he had created was soon divided among many Macedonian rulers. Yet all the results of his work were not lost. The small Hellenic State had disappeared forever with its narrow exclusiveness, and a more tolerant attitude was maintained by the Greek world after him. The Romans

entered into the fruit of his conquests, and the spread of Christianity in the East was made the easier by them.

Consult: Droysen, *Geschichte Alexanders des Grossen* (Gotha, 1898); Grote, *History of Greece* (New York, 1853-56); Holm, *Griechische Geschichte*, vol. iii (Berlin, 1893); B. I. Wheeler's *Life* (New York, 1900); J. P. Mahaffy, *The Story of Alexander's Empire* (1886); *Progress of Hellenism in Alexander's Empire* (1905). See ALEXANDER, LEGEND OF.

ALEXANDER, THE PAPHLAGONIAN. A celebrated impostor of the early part of the second century A.D., of whom Lucian gives a description. He was born at Abonouteichos, in Asia Minor, and after being for some time associated with another charlatan named Coccynas, of Byzantium, returned to his native place and established a pretended oracle of Æsculapius, whom he showed in the form of a serpent. Here he gained great reputation, which extended even to Italy. He was especially resorted to during the plague of 166 A.D..

ALEXANDER, SIR WILLIAM, EARL OF STIRLING (c.1567-1640). A Scottish poet and statesman; born probably at Menstrie. He was educated at Glasgow University, traveled on the Continent, was tutor to the young Earl of Argyle, and so found access to the court of James I of England. He wrote sonnets, the *Four Monarchick Tragedies*, *Elegy on the Death of Prince Henry*, *Doomsday*, and many minor poems. In 1621 he received the largest gift ever bestowed on a subject, viz., a "gift and grant" of Canada, including Nova Scotia and Newfoundland; a striking expression of royal ignorance of geographical limits in America. Charles I confirmed the grant. Alexander was made Secretary of State for Scotland in 1626, in 1630 was created a peer as Lord Alexander of Tullibody and Viscount Stirling, and was made judge of the Sessions in 1631. The next year he built the Argyle House, still one of the sights of Stirling. In 1633 he was made Earl of Stirling and Viscount of Canada and in 1639 Earl of Dovan. Consult *Poetical Works*, with memoir (Glasgow, 1870-73), and for his biography, Rogers, *Memorials of the Earl of Stirling* (1877).

ALEXANDER, WILLIAM (1726-83). An American soldier, generally called "Lord Stirling." He was born in New York City and was the son of James Alexander (q.v.). He served in the French and Indian War, first as commissary and then as aid-de-camp to General Shirley: but went to England in 1756 to defend Shirley against the charge of neglect of duty (see SHIRLEY, WILLIAM), and to urge his claim before the House of Lords to the earldom of Stirling, through descent from Sir William Alexander, Earl of Stirling (c.1567-1640). This claim was not allowed, and in 1761 he returned to America. He soon became Surveyor-General and a member of the Provincial Council, and in November, 1775, enlisted as Colonel in a New Jersey regiment. In January, 1776, he was promoted to the rank of Brigadier-General, and on August 27 took a conspicuous part in the battle of Long Island (q.v.), where his brigade was almost annihilated and he himself was captured. He was exchanged within a month, became a Major-General in February, 1777, served with great gallantry and efficiency in the battles of Brandywine, Germantown, and Monmouth, and subsequently was in command at

Albany, N. Y., until his death. He was well educated, was an enthusiastic student of mathematics and astronomy, and was one of the founders and first governor of King's College (now Columbia University). He published a pamphlet entitled *The Conduct of Major-General Shirley, Briefly Stated* (1756), and *An Account of the Comet of June and July, 1770*. Consult W. A. Duer, *Life of William Alexander, Earl of Stirling*, in the collection of the New Jersey Historical Society for 1847, and Charles Rogers, *Memorials of the Earl of Stirling and of the House of Alexander*, 2 vols. (Edinburgh, 1877).

ALEXANDER, WILLIAM (1824–1911). Protestant Archbishop of Armagh and Primate of all Ireland. He was born at Londonderry and was educated at Tunbridge School and at Exeter and Brasenose colleges, Oxford. After entering holy orders he first served a curacy in the north of Ireland, and later became chaplain to the Marquis of Abercorn, Lord Lieutenant of Ireland. He then successively occupied the positions of Dean of Emly (1863) and Bishop of Derry and Raphoe (1867). In 1896 he was enthroned as Archbishop of Armagh. Bishop Alexander, who was select preacher before the universities of Oxford (1870–72 and 1882), Cambridge (1872 and 1892), Dublin (1879), and lecturer at Columbia College (1892), was the author of the following important works: *Witness of the Psalms to Christ* (Bampton Lectures, 3d ed., 1890); *Verbum Crucis* (1892), *Discourses on Epistles of St. John* (1889), *Commentaries on Epistles to Colossians, Thessalonians, Philemon* (Speaker's Commentaries, vols. iv, v); *St. Augustine's Holiday and Other Poems* (1887); *Primary Convictions* (2d ed., 1898); *Leading Ideas of the Gospels* (3d ed., 1898); *The Finding of the Book, and Other Poems* (1900); *Our National Church* (1906).

ALEXANDER, WILLIAM LINDSAY (1808–84). A Scotch divine, born in Edinburgh. He was educated at Edinburgh and St. Andrews, became pastor in Edinburgh, 1835, and professor of theology in the Congregational Theological Hall in that city, 1854. He was a member of the Old Testament Company of the Bible Revision Committee. His publications embrace *The Connection and Harmony of the Old and New Testaments* (London, 1841; 2d ed., 1853); *The Ancient British Church* (1852; ed. by S. G. Green, 1891); *Christ and Christianity* (1854); *Life of Ralph Wardlaw, D.D.* (Edinburgh, 1856); *Labor and Adventure in Northern Europe and Russia* (ed. by J. Paterson, D.D., London, 1858); *A Commentary on Deuteronomy* (1881), and one on *Zechariah* (1885), edited with a life; Charles Ferme's *Analysis on Romans* and A. Melville's *Commentary on Romans*, both translated from Latin (Edinburgh, 1860); and the third edition of Kitto's *Biblical Encyclopædia* (3 vols., 1862–66), translation of Haevernick's *Introduction* (1852), and part of *Dorner's Person of Christ* (1861). For his biography, consult J. Ross (Edinburgh, 1886).

ALEXANDER ÆGUS. See ROXANA.

ALEXANDER ÆTO'LUS (Gk. Ἀλέξανδρος ὁ Αἰτωλός, *Alexandros ho Aitōlos*). A Greek poet (c.315–265 B.C.), the one Ætolian poet of whom we have knowledge. Though born in Ætolia (q.v.), he lived mainly at Alexandria, where he was considered one of the seven poets of the Alexandrian tragic pleiad; he was busy there also in the library. (See ALEXANDRIAN AGE.) He also wrote short epics, elegies, and

epigrams, of which fragments have been preserved. These fragments, published in Bergk's *Poetæ Lyrici Græci*, attest the cultivated taste of the writer and prove him one of the immediate predecessors of Callimachus. Consult Couat's *La poésie alexandrine* (1882); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, vol. i (Leipzig, 1891–92).

ALEXANDER ARCHIPELAGO. A group of over 1100 islands and islets off the west coast of Alaska, U. S., in lat. 54° 40' to 58° 25' N. Chichagof, Baranof, Kupreanof, Kuiu, Admiralty, and Prince of Wales are the largest. The town of Sitka is on Baranof Island, the most important of the group.

ALEXANDER BALAS. King of Syria (150–145 B.C.). He was probably born in 173 B.C. Whether he was the second son of Antiochus IV Epiphanes who had escaped when his brother Eupator was murdered, as he himself claimed, and Eumenes and Attalus, of Pergamum, and Ptolemy VII Philometor, of Egypt, maintained, or an impostor possessing a marked resemblance to Eupator, used as a tool by Eumenes, as Diodorus, possibly on the authority of Polybius, the friend of Demetrius, states, cannot be positively decided. In 153 he appeared in Rome with Laodice, the daughter of Antiochus Epiphanes, to plead his cause. Supported by Rome, Pergamum, Cappadocia, and Egypt, he struggled with Demetrius I. In 152 he appointed Jonathan, the Hasmonæan, as high priest, an office which the latter publicly assumed at the Feast of Tabernacles of that year. In 150 B.C. Alexander married Cleopatra, daughter of Ptolemy VII Philometor, and on that occasion conferred on Jonathan the titles of military and civil governor. In 147 B.C. Apollonius, Governor of Cœle-Syria, took up arms for Demetrius II, but was defeated by Jonathan at Ashdod. The Hasmonæans had every reason to be pleased with Alexander. But he was an incapable and corrupt ruler and hated by his soldiers, who deserted him in 145 B.C. He fled to Abbae, in Arabia, and was there assassinated. His official surnames were Theopator Euergetes, but in Syria he was also called Balas, which may represent Baal. See Niese, *Geschichte der griechischen und makädonischen Staaten*, vol. iii (1903); Bevan, *The House of Seleucus II* (1902); Bouché Leclercq, *Histoire des Seleucides* (1913).

ALEXANDER COL'UMN (Russ. *Aleksandrovskaia Kolonna*). A monument to Alexander I of Russia. See SAINT PETERSBURG, *Topography*.

ALEXANDER JANNÆ'US (Lat. form of Heb. *Yannai*, Jonathan) (129–78 B.C.). King and high priest of the Jews from 104 to 78 B.C. He was warlike and energetic and extended the frontiers of his kingdom toward the west and the south. Severely defeated by Ptolemy Lathyrus in Galilee, he formed an alliance with Cleopatra of Egypt and drove the invader from the country. Wars with the Moabites, the Ammonites, and the Arabians engaged his attention till his death. Internally his reign was marked by bitter conflicts between the Sadducees, of which party he was the head, and the Pharisees, who comprised the vast mass of the people. It is estimated that 50,000 people perished in the civil strife. In putting down a revolt at Jerusalem he slaughtered 6000 of the insurgents, and in the year 86, returning triumphantly from exile, where he had been driven by the Pharisees,

he caused 800 rebels to be crucified in his presence and their wives and children to be butchered before their eyes. Consult Josephus, *Antiquities of the Jews*, book xiii, chaps. xii–xv, and *Jewish War*, book i, chap. iv.

ALEXANDER JOHN I (1820–73). Prince of Rumania from 1859 to 1866. He was a Moldavian boyar, by name John Cuza, who, when Moldavia and Wallachia determined to form a Rumanian State, was elected Prince of Rumania under the above title by the Assemblies. He received the recognition of the Sultan in 1861. His reign was arbitrary and unconstitutional and convinced the Rumanians of the impracticability of having as sovereign one of their own number. He followed the example of Napoleon III in his methods, endeavoring to mask arbitrary government under plebiscites and universal suffrage. He became exceedingly unpopular and was forced to abdicate in 1866.

ALEXANDER KARAGEORGEVITCH, kä'râ-gâ-ôr'gâ-vich (1806–85). Prince of Servia, born at Topola. He was for a time an officer in the Russian army and was chosen prince in 1842. Wholly under Austrian influence, he angered the National party by his neutrality during the Crimean War and in 1858 was deposed. He was accused of conspiracy in the murder of the Prince Michael (1868) and was sentenced to an imprisonment of 20 years *in contumaciam*. The few reforms accomplished during his reign are not to be attributed to him.

ALEXANDER LAND. A land area in the Antarctic (lat. 68° 43' S., long. 70° to 75° W.), discovered by Bellingshausen in 1821.

ALEXANDER NEVSKI, nyëf'skê (1220–63). A Russian hero and saint. He was born at Vladimir, the son of Prince Yaroslav of Novgorod. In order to defend the country, which was attacked on all sides, but especially by the Mongols, his father left Novgorod, intrusting the government to his sons, Feodor and Alexander. Feodor died soon after. Alexander vigorously resisted the enemy, but Russia was forced to submit to the Mongol dominion in 1240 A.D. Alexander now fought to defend the western frontier against the Danes, the Swedes, and the Teutonic Knights. He received the surname of Nevski from the splendid victory over the Swedes, which he won in 1240 on the Neva, in the region where St. Petersburg now stands. In 1242 on the ice of Lake Peipus he defeated the Livonian Knights of the Sword, who had been instigated by the Pope to attack the Russian heretics. After the death of his father, in 1246, he became Grand Duke of Kiev and Novgorod, and in 1252 through the influence of the Tatars Grand Duke of Vladimir. Pope Innocent IV made a diplomatic attempt in 1251 to reunite the Greek and Roman churches, since his military scheme had failed, and with this end in view sent an embassy to Alexander, which, however, proved ineffectual. To the end of his life Alexander remained a vassal of the Tatars or Mongols. Thrice he had to renew his oath of fealty to the Asiatic barbarians, making in each instance a journey to their camp. He died Nov. 14, 1263, on his return from the last of these journeys. The gratitude of the nation perpetuated his memory in popular songs and even canonized him. Peter the Great honored his memory in 1723 by building a magnificent convent on the spot where he had fought his great battle, and in 1725 founded the knightly order of St. Alexander Nevski.

ALEXANDER OF APH'RODIS'IAS. A Peripatetic philosopher, who was born at Aphrodisias in Caria and lived about 200 A.D. He was the most learned and intelligent Greek commentator on Aristotle (especially on the *Metaphysics*) and was known as "The Exegetes," or "The Expounder." His works, which formed a rich mine for later interpreters, especially Simplicius (q.v.), were early translated into Latin, and are thus in large part preserved; they are still of good service in the interpretation of Aristotle. He also wrote original treatises, the most important of which are those *On Fate* and *On the Soul*. At the time of the Renaissance a philosophic school which adopted Aristotle's views on immortality was named after him "the Alexandrist" (q.v.).

ALEXANDER OF HALES, hâlz (Lat. *Alexander Halensis*) (?–1245). A famous English theologian, known as "the Irrefragable Doctor." He was born in Hales, Gloucestershire, but had attended the schools of Paris, had taken the degree of doctor, and had become a noted professor of philosophy and theology there, when (1222) he suddenly entered the Order of the Franciscans and became a lecturer among them. He resigned in 1238 and died as a simple monk in Paris, 1245. His chief and only authentic work is the *Summa Universæ Theologiæ* (best ed., 4 vols., Venice, 1576), written at the command of Pope Innocent IV, and enjoined by his successor, Alexander IV, to be used by all professors and students of theology in Christendom. Alexander gave the doctrines of the Church a more rigorously syllogistic form than they had previously had and may thus be considered as the author of the scholastic theology. Instead of appealing to tradition and authority, he deduces with great subtlety, from assumed premises, the most startling doctrines of Catholicism, especially in favor of the prerogatives of the papacy. He refuses any toleration to heretics and would have them deprived of all property; he absolves subjects from all obligation to obey a prince who is not obedient to the Church. The spiritual power, which blesses and consecrates kings is, by that very fact, above all temporal powers, to say nothing of the essential dignity of its nature. It has the right to appoint and to judge these powers, while the Pope has no judge but God. In ecclesiastical affairs, also, he maintains the Pope's authority to be full, absolute, and superior to all laws and customs. His work marks the completion of the first great period of scholasticism.

ALEXANDER OF PHERÆ. See PHERÆ.

ALEXANDER OF THE NORTH, THE. Charles XII of Sweden. Sometimes so called from his warlike exploits.

ALEXANDER POL'YHIS'TOR (Gk. Πολύιστωρ, *polyhistōr*, very learned). A famous historian of the first century B.C., who was a native of Cottyacum, in Phrygia, but was educated at Miletus. In Sulla's war against Mithridates he was taken captive and brought to Rome, where Cornelius Lentulus gave him his freedom. Sulla afterward granted him Roman citizenship. Alexander gained the surname Polyhistor because of the great number of his historical works; but he also wrote on geography, grammar, science, rhetoric, and philosophy. All of his books have perished; but they were extensively quoted by Pliny the Elder, Diogenes Laertius, and particularly Clement of Alexandria and Eusebius. These excerpts show him to

have been a rather poor compiler without marked literary ability or historical judgment. But he was evidently a great reader, and he perused Jewish and Samaritan works as well as Greek authors. Thus the world is indebted to Alexander for all extant information concerning such Jewish writers as Philo, the epic poet; Ezekiel, the tragedian; Eupolemus, the historian; Demetrius, the historian; Artapanus, the chronicler; Aristeeas, the historian, and such Samaritan writers as Theodotus and Molon. The genuineness of these fragments has been doubted by Rauch and Cruice; but the defense by Müller, Freudenthal, and Schürer is quite convincing. Alexander refers twice to the Bible and gives from Berosus the story of the Deluge and possibly also the legend of the confusion of tongues. The text of the fragments will be found in Eusebius, *Præparatio Evangelica* (London, 1842) and Clement, *Stromata*, i, 21, 130 (Oxford, 1869); Müller, *Fragmenta*, iii, 211 ff., and translated in I. R. Cory's *Ancient Fragments* (London, 1876), J. Freudenthal, *Hellenistische Studien* (Breslau, 1875), Unger, in *Philologus*, 1888, Montzka, in Lehmann's *Beiträge zur alten Geschichte*, ii, pp. 351 ff. (1902), and E. Schürer's *Geschichte des jüdischen Volkes*, iii, 469 ff. (4th ed., 1909), discuss excellently the question of their genuineness.

ALEXANDER SEVERUS (c.205–235). Emperor of Rome from 222 to 235 and cousin, adopted son, and successor of Elagabalus. The excellent education which he received from his mother, Julia Mammæa, rendered him one of the best princes in an age when virtue was reckoned more dangerous than vice in a monarch. He sought the society of the learned; Paulus and Ulpian, the jurist (q.v.), were his counselors; Plato and Cicero were, next to Horace and Vergil, his favorite authors. Although a pagan, he revered the doctrines of Christianity, and often quoted the saying, "Whatsoever ye would that men should do to you, do ye even so to them." Beloved as he was by the citizens on account of his equity and wisdom, and for the simplicity and purity of his life, he was too weak to maintain discipline in the army, and so soon became an object of hatred to the unruly Prætorian Guards. His first expedition, against Artaxerxes, King of Persia, was happily terminated by a speedy overthrow of the enemy. But during one which he undertook against the Germans on the Rhine, to defend the frontiers of the Empire from their incursions, an insurrection broke out among his troops, headed by Maximinus, in which Alexander was murdered, along with his mother, not far from Mainz. The grateful people, however, enrolled him among the gods. After his death military despotism obtained the ascendancy.

ALEXANDER'S FEAST, OR THE POWER OF MUSIC. An ode written by John Dryden for St. Cecilia's Day, 1697. It contains a number of lines now familiar from quotation.

AL'EXAN'DRA, CAROLINE MARIE CHARLOTTE LOUISE JULIE (1844—). Dowager Queen of England, was born at Copenhagen, Dec. 1, 1844, the daughter of Christian IX, King of Denmark. She was married to Albert Edward Prince of Wales, March 10, 1863, and had three sons (two of whom have since died) and three daughters. She visited Russia at the time of the death of Alexander III and also made several visits to Denmark. She took interest in many benevolent enterprises and became an ac-

complished musician, holding the degree of honorary musical doctor. Upon the accession of Albert Edward to the throne (1901) she became Queen of England, and reigned with him until his death, May 6, 1910. She celebrated in 1913 the fiftieth anniversary of her wedding and of her arrival in England. Consult S. A. Tooley, *Queen Alexandra* (London, 1902). See EDWARD VII.

ALEXANDRA, FEODOROVNA. Empress of Russia. See ALEXANDER III.

ALEXANDRA FALLS. See HAY RIVER.

ALEXANDRE, ä'läks-än'drä, RABBI AARON (c.1766–1850). A German chess-player, born at Hohenfeld, Bavaria. He went to Strassburg in 1893, as an instructor in German, and subsequently to Paris and London. He published an *Encyclopédie des échecs* (1837) and a *Collection des plus beaux problèmes d'échecs* (1846), both still valuable.

ALEXANDRE LE GRAND, ä'lëks'än'dr' le grän'. The name of a tragedy by Racine, produced in 1665. The actress who played Axiane in this piece was the cause of a bitter rivalry between Racine and Molière.

AL'EXANDRET'TA, or **ISKANDERUN**, is-kän'de-röön'. A seaport of Asiatic Turkey, in the vilayet of Adana, on the Gulf of Iskanderun, which forms the extreme northeast nook of the Mediterranean Sea, 70 miles from Aleppo and 45 miles from Antioch by rail (Map: Turkey in Asia, G 4). It is surrounded by hills in a very picturesque locality. The harbor is naturally one of the best on this coast, and the town is important strategically because it commands Beilan Pass, the gateway to northern Syria. It is the port of Aleppo and the seat of an extensive trade in silk goods, wool, hides, leather, licorice, butter, cloth, and some raw products, amounting in 1910 to about \$10,000,000 for imports and about \$6,500,000 for exports. The population is about 9000. Alexandretta is the seat of a United States vice consul.

ALEXANDRI, ä'lëks-än'drë. See ALECSANDRI.

AL'EXAN'DRIA (Ar. *Iskanderieh*). A city founded by Alexander the Great, in the winter of 332 B.C., on the site of an Egyptian town, Rhacotis (Map: Africa, G 1). It was situated at the Canopic mouth of the Nile, on the low ridge separating Lake Mareotis from the Mediterranean, and was laid out by the architect Dinocrates (q.v.), of Rhodes, in the form of a parallelogram; two main streets, lined with colonnades and said to have been 200 feet wide, crossed at right angles, though somewhat to the north and east of the centre lines. The other streets were also at right angles with one another, and the arrangement seems to have remained undisturbed for a long period, although the level of the city was raised and new streets laid out above the old ones. The city had a fine double harbor, formed by building a mole (the Heptastadion), 7 furlongs in length, to the island of Pharos, off the northeast end of which was a lighthouse, regarded as one of the wonders of the world. (See PHAROS.) The small harbor, on the west, was open, but the large harbor was entered only by a narrow passage between the Pharos lighthouse and a mole built out from the promontory Lochias on the east of the city. The city grew rapidly and became one of the chief centres of the trade between the east and the west, while the generous policy of the Ptolemies, who made it their capital, attracted a large foreign population. In Roman

days the city was the capital of Egypt. (See EGYPT, near the end of the article.) At Alexandria, under the Romans, there was a very important mint.

Egyptians, Greeks, and Jews were the chief elements, each gathering in a special quarter of the city. On Lochias were the royal palaces, and the neighboring part of the city was filled with magnificent buildings, including the museum and the famous library (see ALEXANDRIAN LIBRARY), the monument of Alexander, the graves of the Ptolemies, the temple of Poseidon, and the Cæsareum—afterward a church, and once marked by the two obelisks known as Cleopatra's Needles, of which one was transported to the Thames Embankment in London in 1878, and the other to Central Park, New York, in 1881. These obelisks were originally erected by Thothmes III and were brought to Alexandria by the Romans. Near the Cæsareum was the great emporium and somewhat to the south lay the Bruchion (Βρύχιον), a residence quarter. The great temple of Serapis lay in the southwest, or Egyptian quarter, where now stands a solitary column, the so-called Pompey's Pillar, a monolith of red granite 73 feet high, erected in 302 A.D. by the Roman eparch, Pompeius, in honor of Diocletian. Earthquakes and floods have changed the surface of the ground, and but few remains are now visible, though excavations conducted for Napoleon III in 1866 by Mahmoud Bey revealed a number of paved streets, and those of 1898-99 by Dr. Noack have thrown much light upon the successive periods of building in the city. The original foundations of the time of Alexander rest on the natural rock and are about 14 $\frac{2}{3}$ feet below the paved streets, which seem to belong to an extensive rebuilding of the city by Antoninus Pius, and are now covered with the earth on which the modern city stands. The policy of Ptolemy Philadelphus and his immediate successors drew not only traders but learned men to the city, and Alexandria became the centre of Greek intellectual life during the third and second centuries B.C. (See ALEXANDRIAN AGE.) The city also developed a very characteristic type of art, which vied with that of Pergamus and seemed to have had great influence on the West. (See ARCHÆOLOGY; ALEXANDRIAN AGE.) Alexandrian influence is marked at Pompeii (q.v.) and in Provence. Consult Mahmoud Bey, *Mémoire sur l'antique Alexandrie* (Copenhagen, 1872); Lombroso, *L'Egitto al Tempo dei Greci e dei Romani* (Rome, 1882, 1886); Aeroutsos Bey, *L'ancienne Alexandrie, étude archéologique et topographique* (Paris, 1888).

In 30 B.C. Egypt passed into the hands of the Romans under Octavius (Augustus), becoming directly subject to the Emperor, and governed by a prefect appointed by him. Under Roman rule Alexandria lost much of its former pre-eminence as the capital of the Hellenistic world; and though for many centuries it continued to be one of the greatest cities of the Empire, especially as one of the chief sources of the grain-supply of Rome, its decline from the magnificent prosperity it had enjoyed under the Ptolemies was rapid after the first century of the Christian era. The Jewish inhabitants of Alexandria joined in the great national revolt of 116 A.D., and in the desperate struggle which ensued the Jewish population was annihilated, and a large part of the city was destroyed. The excesses of the Alexandrian mob, famous

throughout the Empire for its fickleness and its violence, plunged the city into misfortunes twice during the third century. In 215 the seditious conduct of the populace led to a general massacre of the inhabitants at the order of the Emperor Caracalla. Forty-five years later civil war broke out among the different quarters of the city, lasting for 12 years and resulting in the destruction of the Bruchion, the richest district of Alexandria, with its ancient palaces, temples, and public buildings. With the rise of Alexandria as one of the great Christian capitals of the Empire, religious tumult took the place, in large measure, of political dissension, and paganism and Christianity fought out their battle in many bloody riots. The triumph of the new faith was signalized in 389 by the destruction of the Serapion, the last refuge of the pagan belief, but religious peace was by no means secured. (On the destruction of books at this time in the Serapion, see F. J. Teggart, in the *New York Evening Post*, July 7, 1898.) Between 413 and 415 the patriarch Cyril led mobs of monks against the heretics and Jews, and one of these militant bands tore to pieces the beautiful pagan priestess, Hypatia (q.v.). In 616 Alexandria was taken by Chosroes, King of Persia. In December, 641, it fell into the hands of Amru, the Mohammedan conqueror of Egypt, General of the Caliph Omar. The story of the destruction at this time of the famous library at the command of the Caliph Omar is discredited. With the Arabian conquest a period of swift decay set in. The commerce of the city was almost entirely diverted to other cities, the last remnants of its prosperity being destroyed by the discovery of the all-water route to India. Toward the end of the eighteenth century its population was probably less than 7000. On July 2, 1798, Alexandria was taken by the French, who held it until Aug. 31, 1801. In the nineteenth century the city entered upon a new era of prosperity under the wise rule of Mehemet Ali. During the disturbances in connection with the rebellion of Arabi Pasha (q.v.), Alexandria was bombarded by the English fleet under Admiral Seymour, July 11-12, 1882.

Modern Alexandria is divided into two parts. The peninsula between the eastern and western harbors is inhabited chiefly by Mohammedans. It has crooked and narrow streets, a large number of mosques, and, with the exception of the palaces of wealthy Turks, few buildings worthy of notice. The European quarter is situated on the mainland south of the eastern harbor. It is well built and has many of the improvements essential to a modern city. The centre of the European city is the Mehemet Ali Square, containing the statue of Mehemet Ali and surrounded by the official buildings and the finest residences of the Europeans. There are three theatres, a number of churches of different denominations, and the museum of Græco-Roman antiquities. Alexandria has two harbors. The eastern is accessible only for vessels of very light draught and is used mostly by fishing vessels. The western harbor is the chief shipping centre; commercial steamers entered, in 1911, 2014 of 3,443,705 registered tons net. There is, besides, the outer harbor, protected by a mole nearly two miles long. Alexandria is at present one of the chief commercial ports on the Mediterranean and the principal port of Egypt. Its imports and exports in 1911 were valued at £E23,680,344 and £E28,014,926 respectively. The chief arti-

cles of export are grain, cotton, beans, sugar, and rice. With Cairo, Alexandria is connected by rail (since 1855) and by the Mahmudieh Canal. Along the latter are situated the summer residences of the Europeans. It is also connected by cable lines with Malta, Cyprus, Crete, and Port Said. The city obtained a new and adequate water supply in 1906. The population was 332,246 in 1907. It consists chiefly of Mohammedans, with about 50,000 Europeans, mostly Greeks and Italians. Consult Sharpe, *Alexandrian Chronology* (London, 1857), and Kingsley, *Historical Lectures and Essays* (New York, 1889). See EGYPT.

ALEXANDRIA, ä'lëks-än'drë-ä. The principal town of the district of the same name in the government of Kherson, Russia, situated at the confluence of the Berezovka and Ingulets rivers, 216 miles from the city of Kherson and about 950 miles from St. Petersburg. The principal occupations of its inhabitants are farming and cattle-raising, and much activity is displayed in its tanning, soap, and candle-making industries. Pop., 1885, 17,400; 1897, 14,000; 1910 (est.), 15,000.

AL'EXAN'DRIA. A villa and country-seat in Peterhof, one of the summer residences of the imperial family of Russia. Planned at the initiative of Alexander I, the noble structure was finished and the grounds laid out only in 1830, during the reign of Nicholas I.

ALEXANDRIA. A city in Madison Co., Ind., 50 miles northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago and St. Louis, and Lake Erie and Western railroads (Map: Indiana, D 2). It has extensive manufactures of glass, paper, mineral wool, and wire fence. Situated in an agricultural region, Alexandria produces much fruit and grain, and many vegetables. The city operates its own water works and has a Carnegie library. Alexandria was first settled in 1834, and is governed under a legislative act of 1905, which provides for a city council of six members and places the mayor's term at four years. The city, once the centre of a natural gas belt, suffered a great loss of population and industrial prosperity with the failure of the gas supply. Pop., 1890, 715; 1900, 7221; 1910, 5096.

ALEXANDRIA. A city and the county-seat of Rapides parish, La., 193 miles northwest of New Orleans, on the Chicago, Rock Island, and Pacific, the Louisiana and Arkansas, the St. Louis, Iron Mountain, and Southern, Morgan's Louisiana and Texas, and the Texas and Pacific railroads; on the line of the Louisiana Railway and Navigation Company; and on the Red River (Map: Louisiana, C 2). It has fine government buildings, a public library, an Elks' Home, a country club, and an opera house. Alexandria is the seat of important commercial and manufacturing interests, principally in cotton, cottonseed oil and cake, sugar, molasses, and lumber. It also produces corn, rice, alfalfa, fruit, and vegetables. The city owns the Artesian water supply, the sewage system, and the electric light and power plant. Pop., 1890, 2861; 1900, 5648; 1910, 11,213; 1913 (est.), 15,000. Alexandria occupies in part the site of an old Indian village. It was once a trading post of the French and Spanish and grew rapidly, being incorporated as a city in 1819. In 1864 the city was almost totally destroyed by fire. Its later development came with the building of the Texas and Pacific Railroad to this point in 1882.

ALEXANDRIA. A city and the county-seat of Douglas Co., Minn., 130 miles northwest of Minneapolis, on the Great Northern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Minnesota, C 5). It is admirably situated in a lake region popular as a summer resort and is the centre of a productive wheat-growing and stock-raising district. The manufactures include flour, furniture, wagons, sleighs, boats and launches, stove fixtures, cutlery, and beer, and the city also has a large cold storage plant, and owns the electric light and water works. Pop., 1890, 2118; 1900, 2681; 1910, 3001; 1913 (est.), 3200.

ALEXANDRIA. A city and port of entry in Virginia. It is on the Potomac River, about 6 miles below Washington, and on the Southern, the Pennsylvania, the Atlantic Coast Line, the Baltimore and Ohio, the Seaboard Air Line, and the Chesapeake and Ohio railroads (Map: Virginia, G 3). Alexandria is 100 miles from the mouth of the Potomac, but the stream which forms its harbor is a mile wide and is accessible to large vessels. The city is able, therefore, to control an extensive and increasing trade. It has several glass factories, machine shops, fertilizer factories, a brewery, a pump factory, a silk mill, tread mills, etc. Alexandria owns and operates its gas plant, and has a public library, a hospital, an Episcopalian Theological Seminary, and notably good schools. It was first incorporated in 1749 and is now governed by a charter of 1879, as revised in 1895. The mayor is elected for four years, and the city council is a bicameral body. The people elect all important officers, such as treasurer, auditor, tax collector, etc., the city council electing the others; the mayor has no power of appointment. At Alexandria, originally called Bellehaven, Braddock made his headquarters before marching against the French in 1755, and here, on April 13, the governors of New York, Massachusetts, Pennsylvania, Maryland, and Virginia met to form plans for the expedition. Alexandria lay within the territory ceded by Virginia to the United States in 1789, but was retroceded in 1846 and again became a part of Virginia in 1847. In 1814 the inhabitants, terrified by the approach of a British fleet, secured immunity from attack by paying the equivalent of about \$100,000. During the Civil War Alexandria was occupied by Federal troops and was the capital of that part of Virginia which adhered to the Union and recognized Pierrepont as Governor. A Confederate monument, entitled "Appomattox," has been erected in the city, and the Marshall House, where Ellsworth was killed, still stands. Washington was one of the first vestrymen of Old Christ Church here. His pew and also that of General Lee are objects of great interest to visitors. Pop., 1890, 14,339; 1900, 14,528; 1910, 15,329; 1913 (est.), 16,000. Consult *Celebration of the First Centennial of the Municipal Government of Alexandria* (Alexandria, 1880).

ALEXANDRIA BAY. A village in Jefferson Co., N. Y., on the St. Lawrence River, 30 miles north of Watertown, reached by trolley from Redwood, on the Rome, Watertown, and Ogdensburg Railroad. It is the principal resort among the Thousand Islands, which lie opposite and below the village in the St. Lawrence. The entire series of islands forms a grand natural, though, to an extent, also artificially improved, park. The water works are owned by the vil-

lage. Alexandria Bay was settled about 1830 and was incorporated first in 1879. It has a library, founded by Dr. J. G. Holland, and a motor boat factory. Pop., 1890, 1123; 1900, 1511; 1910, 1899; 1913 (est.), 2000.

AL'EXAN'DRIAN AGE. The best literature of ancient Greece, especially poetry, had been fostered by two forces, religion and political freedom. With the loss of political liberty in Greece under Macedonian domination, creative power declined also, and Athens ceased to occupy the preëminent position in literature which she had so long held. During the third century B.C. Alexandria became the centre of science and literature under the direction of the Ptolemies, who used their wealth to attract poets, scholars, and artists to their capital. The religion of Alexandria by this time was not Hellenic, but predominantly Oriental. Ptolemy Soter invited to his court the learned Peripatetic philosopher, Demetrius of Phalerum, under whose advice he laid the foundations of the later collections and libraries. His son, Ptolemy Philadelphus (285-247), however, by his large expenditures became the actual founder of the museum and the libraries; his successor, Ptolemy Euergetes (247-222), fostered especially mathematical and geographical investigations; and the succeeding rulers continued the support of learning in varying degrees. The centre of intellectual life was the library in connection with the museum. This was enriched in every possible way; the total number of books about 250 B.C. is put by Tzetzes (q.v.) at upward of 530,000. The museum had porticoes, lecture halls, and rooms in which scholars lived free of cost; some of the most eminent among these received large annuities from the royal purse. The school thus established resembled in many ways a university. The highest honor attainable was the position of librarian; this was held between 285 and 150 B.C. successively by Zenodotus, Callimachus, Eratosthenes, Apollonius, Aristophanes, and Aristarchus. The chief activity of these grammarians was directed to collecting and preserving what had come down from earlier ages, to establishing standard editions of authors and to the publication of explanatory comments on them. Lists of the best authors (Canons) were also drawn up, as of the five tragedians, the nine lyric poets, and the 10 orators. Intellectual curiosity and the cosmopolitan character of the population led to translation into Greek of works in the Semitic tongues; the so-called Septuagint version of the Old Testament was made under Ptolemy Philadelphus.

Creative poetic impulse was now nearly dead, although bucolic poetry, epigram, and elegy still show originality. Most of the poets, however, were imitators who depended on learning and art and not on genius; they studied closely the works of their predecessors, reproducing more or less closely their form, but for the most part lacking their inspiration. In poetry, then, as in other fields, the Alexandrian Age is marked primarily by reflection, research, and erudition. The most important names are those of Theocritus, Apollonius Rhodius, Callimachus, Aratus, Nicander, Euphorion, and Lycophron. At this time mathematics and astronomy also flourished; the most important names in this field in the pre-Christian period are the names of Euclid, Apollonius, Eratosthenes, Aristarchus, Hipparchus, and Hero, with whom must be reckoned also Archimedes, although his life

was spent at Syracuse. Of the later scholars, Ptolemy (Claudius Ptolemæus) (second century A.D.) is famous for his geographical and astronomical works. In the field of pure and applied sciences the Alexandrian Age achieved much. Thus, Aristarchus measured the sun and the moon; Euclid wrote the first systematic treatise on geometry; Archimedes applied mathematics to hydrostatics; Apollonius of Perga wrote the first systematic treatise on conic sections; Eratosthenes worked out a calendar which was the basis of the Julian calendar; Hipparchus determined within six minutes the length of the solar year. Even after the fall of the Ptolemaic dynasty, the museum, libraries, and schools continued to make Alexandria a great intellectual centre for many centuries; the schools of philosophy in particular enjoyed great prosperity, but literary activity had by this time centred in Rome. Under Cæsar a large part of the collection of books was burned; but the loss was repaired in some measure by the removal of the Pergamene library to Alexandria and by acquisitions elsewhere. During the fourth century A.D. the city suffered severely from the struggles between Greeks and Christians, and finally Occidental learning ceased with the conquest by the Arabs in 641. See ALEXANDRIA.

Alexandrian Philosophy. The Alexandrian philosophy is characterized by a blending of the philosophies of the East and of the West, and by a general tendency to eclecticism, as it is called, or an endeavor to patch together, without really reconciling, conflicting systems of speculation, by bringing together what seemed preferable in each. Here belongs the work of Aristobulus (q.v.). The Alexandrian philosophers were, however, not without their sects; the most famous of these were the Neo-Platonists (q.v.). Uniting the religious notions of the East with Greek dialectics, they represent the struggle of ancient civilization with Christianity; and thus their system was not without influence on the form that Christian dogmas took in Egypt. The amalgamation of Eastern with Christian ideas gave rise to the system of the Gnostics (q.v.), which was elaborated chiefly in Alexandria.

On the museum and libraries, see ALEXANDRIAN LIBRARY; MUSEUM; PTOLEMY I; and consult: Ritschl, *Die alexandrinischen Bibliotheken* (Breslau, 1838) and Couat, "Le Musée d'Alexandrie," in *Annales de Bordeaux* (Paris, 1879); also, in general matters, Simon, *Histoire de l'école d'Alexandrie* (2d ed., Paris, 1845); Saint-Hilaire, *De l'école d'Alexandrie* (Paris, 1844-45), and Vacherot, *Histoire critique de l'école d'Alexandrie* (Paris, 1846-51); J. E. Sandys, *A History of Classical Scholarship* (New York, 1906-08); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (Leipzig, 1891-92); Baumgarten, *Die Hellenistisch-Römische Kultur* (Leipzig, 1893).

Alexandrian Art. The style of art inaugurated in the time of Alexander, centring in the city of Alexandria. It prevailed throughout the Græco-Oriental States up to the time of the Roman conquest, and even then continued to exercise great influence on the formation of Roman art. Its characteristics were: (1) Regularity of plan in laying out cities; (2) love of the colossal, exaggerated, and picturesque in architecture and sculpture; (3) invasion of the element of color and pictorial effect in all arts;

(4) love of the comic and the obscene; (5) rise of portraiture and *genre*. The old Hellenic poise had departed, and the art was one of extremes; it sought its models in every-day life and did not care for types of gods or men. The art of Pompeii shows how this art permeated Roman civilization at the beginning of the Empire. Consult: G. Schreiber, *Die hellenistischen Reliefbilder* (Leipzig, 1894); Collignon, *Histoire de la sculpture grecque* (Paris, 1892-97); Gardner, *Handbook of Greek Sculpture* (London, 1896-97); Mitchell, *A History of Ancient Sculpture* (New York, 1883); Woltmann and Woermann, *Geschichte der Malerei* (Eng. trans., New York, 1880); Mau-Kelsey, *Pompeii: Its Life and Art* (New York, 1902).

ALEXANDRIAN CO'DEX. See BIBLE.

ALEXANDRIAN LI'BRARY. The plan for this, the most famous collection of the ancient world, seems to have been formed by Ptolemy I, Soter (died 283 B.C.), perhaps at the suggestion of an Athenian, Demetrius of Phalerum. The development of this plan and the connection of the library with the museum was the work of Ptolemy II, Philadelphus, about 275 B.C., who collected books on a scale hitherto unknown and placed them at the disposal of the learned men gathered in the museum. (See ALEXANDRIAN AGE.) The management was intrusted to a series of scholars, whose labors led them to a careful study of Greek literary history and the classification of writers, with results of great importance for the transmission of classical texts to our own time. The first librarian was Zenodotus of Ephesus, under whom the poets were arranged. The first catalogue seems to have been the work of Callimachus, and included a classification of the authors, according to their principal themes, as historians, orators, etc. Under each author's name were given a brief biographical sketch, a list of his genuine and spurious works, the opening words of each work, a brief table of contents, and the number of lines occupied in the standard MSS. Variations in names or titles were carefully noted. In the time of Ptolemy Philadelphus, the number of rolls in the main library was 490,000 (often a roll contained more than one work), and in the annex, in the temple of Serapis, the Serapeum (q.v.), 42,800. At the time of Cæsar's visit, in 47 B.C., the number had risen to 700,000, of which a part was consumed in a great fire, which spread from the burning royal fleet, which Cæsar had fired to prevent its falling into the hands of the Egyptians. This loss was in part replaced by the library of Pergamus, which Antony gave to Cleopatra. In Roman times, however, the chief literary centre seems to have been the library in the Serapeum, which was destroyed when the Christians sacked the temple (390 A.D.). The fate of the rest of the library after the loss of its most valuable part is unknown, but it seems likely that much of it had been lost before the surrender of the city to the Arabs, perhaps in the time of Aurelian (272), when the larger part of the district in Alexandria in which the main library was situate was laid waste. The story of the destruction of the books by order of the Caliph Omar is now universally discredited, as resting on very unreliable sources. Consult: Ritschl, "Die Alexandrinischen Bibliotheken," in his *Opuscula Philologica*, vol. i (Leipzig, 1867); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (Leipzig, 1891-92); and J. E.

Sandys, *A History of Classical Scholarship*, vol. i, pp. 107 ff. (New York, 1908). See ALEXANDRIA.

AL'EXAN'DRIANS, EPISTLE TO THE. See APOCRYPHA, *New Testament*.

ALEXANDRIAN SCHOOL. 1. A school of theology founded in Alexandria by Pantænus (180-203), taught by Clement of Alexandria and by Origen, and carried on until the end of the fourth century. It presented Christian truth as modified by philosophic speculation. It was well attended and very influential. Many of the great leaders of orthodoxy came from it, as Athanasius, Cyril, the two Gregories, and Basil. In biblical interpretation it stood for the allegorical method. Consult Kingsley, *Alexandria and her Schools* (London, 1854). 2. The term is also used for the general tendencies in literature, art, and philosophy which arose in Alexandria. This city was the meeting-place of East and West, and its influence was for a tolerant cosmopolitanism.

ALEXANDRINES, ăl'ĕg-zăn'drĭnz. Rhyming verses, consisting each of 12 syllables of six measures. The name is most probably derived from an old French poem on Alexander the Great, belonging to the twelfth or thirteenth century, in which this measure was used; according to others, it was so called from the name of the author of that poem. The Alexandrine became the regular epic, or heroic, verse of the French, among whom each line was divided in the middle into two hemistichs, the cesura, or pause, falling at the end of the sixth syllable. Though Corneille was usually very careful to observe this rule, French poets, from Racine on, have not hesitated to take the greatest liberties with it in order to avoid the monotonous regularity. In Victor Hugo's *La légende des siècles* the cesura may be found in almost any part of the line; and there are verses which have as many as two or three cesuras. Nor in English is this rule always observed, as in the following verse from Spenser:

That all the woods shall answer, and their echo ring.

The only considerable English poem wholly written in Alexandrines is Drayton's *Polyolbion*; but the Spenserian stanza regularly ends in an Alexandrine, and the measure occurs occasionally in blank verse and in our common heroic verse, as the last verse of a couplet:

When both are full, they feed our blest abode,
Like those that watered once the paradise of God. — *Dryden*.

AL'EXAN'DRISTS. Those Renaissance followers of Aristotle who attached themselves with much zeal to the interpretation of Aristotle given by Alexander of Aphrodisias. They stood in bitter rivalry with the Averroists and the Thomists. The dispute concerned itself chiefly with the relation between the individual soul and the universal reason, and with the consequences of this relation for personal immortality. The Thomists, following Thomas Aquinas, held that Aristotle regarded reason as belonging to the individual soul; the Alexandrists maintained that Aristotle considered the individual soul as a merely animal and mortal function, which during the earthly life alone is rationalized by the informing power of universal reason; the Averroists held the intermediate view, viz., that the universal reason works upon the soul and makes it actual intelligence, and then incorporates this actual intelligence with its own eternal nature. Accordingly, the Thom-

ists believed in individual immortality, the Alexandrists in no individual immortality, and the Averroists in the immortality of what has been the individual, but has lost its individuality, to be taken up as a permanent element in the life of God. The leading Averroists were Nicoletto Vernias (died 1499), Alessandro Achilini (died 1518), and Agostino Nifo (1473-1546); the leading Alexandrists were Ermolao Barbaro (1454-93) and Pietro Pomponazzi (1462-1524), the leading Aristotelian of his time; among the Thomists of the Renaissance may be mentioned Francis Suarez (1548-1617). Consult Ueberweg-Heinze, *Grundriss der Geschichte der Philosophie* (Berlin, 1894-98; Eng. trans. by Morris, New York, 1871), and E. Renan, *Averroès et l'Averroïsme* (Paris, 1852).

AL'EXAN'DRITE. See CHRYSOBERYL.

ALEXANDROPOL, ä'lëks-än-drō'pōl (*Alexander* + Gk. πόλις, *polis*, city), formerly GUMRI. A fortified town in Russian Armenia, 85 miles southwest of Tiflis, and 30 miles from Kars on the Arpa-Tschai (Map: Russia, F 6). It is the largest town in the Aras basin, and its importance as a strategic point commanding the entrance to Armenia was recognized by the Russians, who, in 1837, founded it as a stronghold. The fort is 300 feet above the town, which is nearly a mile above sea level, and is large and strong, capable of accommodating 10,000 soldiers. It has been the scene of several encounters between the Russians and the Turks. The chief industry of the town is the manufacture of silk. Pop., 1885, 22,600; 1897, 32,000.

ALEXANDROV, ä'lëks-än'drof. A town in Russia in the government of Vladimir, on an affluent of the Kliasma, a branch of the Volga, 72 miles east of Moscow (Map: Russia, E 3). It was a favorite summer residence of the Czar Ivan the Terrible, who introduced here in the sixteenth century the first printing-press used in Russia. There is here a magnificent imperial stud, established by the Empress Elizabeth in 1761 and completed about 20 years after. The town is noteworthy for its convent, in the burial grounds of which are kept the remains of two sisters of Peter the Great. Steel and cotton manufactures are prominent industries. Pop., 1885, 6700; 1897, 6848.

ALEXANDROVSK, ä'lëks-än'drofsk. A fortified town in the south of Russia, in the government of Ekaterinoslav, on the left bank of the Dnieper, below the cataracts, about 80 miles by rail south of Ekaterinoslav (Map: Russia, E 5). Inland productions are shipped here for the Black Sea, and it is known for its storing facilities, but it has no considerable industries of its own. In the vicinity there are many hillocks, or mounds, which are in all probability the graves of the great chiefs of the ancient Scythians. Opposite the town is the Khortista Island, the chief seat of the famous Zaporogian Cossacks in the seventeenth century. Pop., 1885, 6700; 1897, 16,393.

ALEXANDROVSK - GRUSHEVSKI, grōō-shëf'skê. A town in the territory of the Don Cossacks, Russia, situated on the river Grushevka, about 20 miles from Novo-Tcherkask. It is well known for the rich coal mines in its vicinity, notably along the banks of the Grushevka. The anthracite coal of these deposits is of remarkable purity, containing as much as 94 per cent of carbon, the highest percentage found anywhere. The discovery of coal in this region dates as far back as the latter part of the

eighteenth century, but exploitation of the mines was not commenced until 1839. The yearly output of the mines averages over half a million tons. Pop., 1910, 45,536.

ALEXEI, ä'lëk-sä', ALEXANDROVITCH (1850-1908). A Russian Grand Duke, fourth son of Alexander II, and uncle of Nicholas II, born Jan. 14, 1850. In 1872 he traveled through the United States. He was Commander-in-Chief of the fleet during the Russo-Japanese War, but the disasters which befell the naval forces of Russia in the course of the war followed by the repeated mutinies of the sailors in the Black Sea and the Baltic revealed the deplorable condition to which mismanagement and corruption had reduced the naval strength of the Empire and led to his resignation in the latter part of 1905.

ALEXEI MIKHAILOVITCH, më-kī'lō-vëch (1629-76). Russian Czar, second of the Romanoffs. He succeeded his father, Michael Feodorovitch, in 1645. Owing to his inexperience and youth, the early part of his reign was a stormy one, but in 10 years he had quelled all insurrectionary feeling and was prepared for foreign conquests. In his two campaigns against the Poles (1654-56 and 1660-67), he took Smolensk, overran and devastated almost the whole of Lithuania, and even secured for himself the possession of several provinces. He also gained a part of the Ukraine; and though his war with Sweden (1656-58) was unfortunate, he lost nothing by the following peace. His reign was also marked by great extension of Russian influence eastward, many freebooting raids of the Cossacks over the central Asiatic steppes, and an actual attack on China via the direction of the Amur River. Alexei conferred great benefits on his countrymen by the introduction of various important reforms into the Russian laws; he ordered translations of numerous scientific works, chiefly of a military nature, and even ventured on some ecclesiastical changes. In his private character he was amiable, temperate, and pious. By his second wife, the beautiful Natalia Naryshkin, he was the father of Peter the Great.

ALEXEI PETROVITCH, pë-trō'vëch (1690-1718). The eldest son of Peter the Great of Russia. He was born at Moscow. Because he had shown himself opposed to the reforms and innovations made by the Emperor, Peter threatened to exclude him from the succession to the throne. With this prospect he appeared to be satisfied and declared his intention of spending the remainder of his days in a monastery. But when Peter the Great undertook his second tour in western Europe, Alexei, under the pretense of following the Czar, escaped in 1717 to Vienna and thence went to Naples. He was induced to return to Russia, where, by the ukase of Feb. 14, 1718, he was disinherited, and an investigation was ordered, for the purpose of detecting persons concerned in his flight. A widespread conspiracy to undo all of Peter's reforms was discovered. Eudoxia, the mother of Alexei, Maria Alexeyevna, step-sister of the Czar, and several other personages were made prisoners and either executed or otherwise punished. Alexei was condemned to death, but soon afterward received a pardon. The terror and agitation of the trial, however, and the actual torture to which he was subjected, led to his death in 1718. The Czar, to avoid scandal, ordered the proceedings at the trial to be published. Other

accounts assert that Alexei was beheaded in prison. By his wife, Charlotte Christine Sophie, of Brunswick-Wolfenbüttel, Alexei left a son, who, as Peter II, was elevated to the throne in 1727. Consult Bain, *The First Romanovs* (London, 1905).

ALEX'IANs. See ALEXIUS.

ALEX'IS. In *The Faithful Shepherdess* (q.v.), by John Fletcher, the name of a shepherd. The name is taken from Vergil's second Eclogue.

ALEXIS, or ALEX'IUS I, COMNE'NUS (1048-1118) (Gk. Ἀλέξιος Κόμνηνος, *Alexios Komnenos*). One of the ablest rulers of the Byzantine Empire. He was born at Constantinople, the son of John Comnenus, brother of the Emperor Isaac Comnenus. In his youth Alexis gave brilliant promise of the vigorous military genius which he afterward manifested, and at length, after some anarchic reigns of brief duration, his soldiers succeeded in elevating him to the throne, while the old and feeble Nicephorus Botaniates, his predecessor, was obliged to retire to a monastery (1081). Gibbon graphically summarizes the position and achievements of Alexis in the forty-eighth chapter of his *Decline and Fall of the Roman Empire*. Everywhere he was encompassed with foes. The Scythians and Turks were pouring down from the north and northeast, the fierce Normans, who had violently effected a lodgment in Italy and Sicily, were menacing his western provinces; and, finally, the myriad warriors of the first crusade burst into his Empire on their way to Palestine, and encamped around the gates of his capital. Yet he contrived to avoid all perils and disgraces by the wisdom of his policy, the mingled patience and promptitude of his character, and his discipline in the camp. He reigned for 37 years, and if it had been possible to preserve the Byzantine Empire in its integrity, a ruler like Alexis might have done it.

Undoubtedly the great interest which attaches to Alexis arises from his relations to the crusaders. Historians differ as to the purity and sincerity of his conduct toward them. His daughter Anna (q.v.), who wrote his life, defends his "policy" with filial piety; but it is clear that he entertained a profound dread and suspicion of the half-civilized Franks and, knowing the weakness of his own Empire, was compelled to dissimulate. He promised them help and persuaded them to go off into Asia; but when they did not keep their agreements, he did not fulfill his promises, and simply used them as his instruments to reconquer from the Turks the islands and coasts of Asia Minor. Perhaps, however, little apology is needed for a monarch who "subdued the envy of his equals, restored the laws of public and private order, caused the arts of wealth and science to be cultivated, and transmitted the sceptre to his children of the third and fourth generations." In addition to Gibbon, consult Chalandon, *Essai sur le règne d'Alexis Ier Comnène* (Paris, 1900).

ALEXIS, or ALEXIUS II, COMNENUS (c.1168-83). Emperor of Constantinople. He succeeded his father, Manuel I, about 1180, and was deposed and strangled by his uncle, Andronicus (1183).

ALEXIS III, ANGELUS (?-1210). Brother of Isaac Angelus, Emperor of Constantinople, whose throne he usurped in 1195. In 1203 his capital was besieged and taken by the Venetians and an army of French crusaders, who reinstated Isaac II. On the capture of the city Alexis III fled, and died a few years afterward in exile.

ALEXIS IV, ANGELUS (?-1204). Byzantine Emperor in 1203-04, son of Isaac II (Angelus). After the flight of his uncle, Alexis III, he was associated with his father in the government. After reigning only a few months, however, he was deposed and put to death by Alexis V.

ALEXIS V, surnamed DUKAS MURTZUPHLOS (?-1204). Byzantine Emperor in 1204. After the murder of Alexis IV (1204), he usurped the throne, but at the end of a few weeks was deposed by the crusaders, who had resolved on a partition of the Empire of the East. He fled to the Morea, where he was seized by the Latins, tried for the murder of Alexis IV, and cast from the top of Theodosius's Pillar. Consult Pears, *Fall of Constantinople* (New York, 1886), and Oman, *Byzantine Empire* (New York, 1912).

ALEXIS, or ALEXIUS, COMNENUS (c. 1180-1222). A grandson of Andronicus I. When Constantinople was captured by the crusaders in 1204, Alexis, taking advantage of the situation, captured Trebizond and some other cities on the Black Sea. He took the title of Grand Komnenos, and became Governor or Duke of Trebizond. His family reigned there for over two centuries and a half. His grandson assumed the title of Emperor. See Gibbon, *Decline and Fall*, edited by Bury, vol. vi (London, 1898).

ALEX'IS (Gk. Ἀλέξϊς) OF THURIL. A Greek comic poet of the third century B.C. He was born at Thurii, in Magna Græcia, and was, according to Suidas (q.v.), uncle and instructor of Menander. He wrote at Athens, where, according to Plutarch, at the age of 106, he died on the stage while being crowned as victor. Suidas assigns to him 245 comedies, of which we know 130 by name; the extant fragments exhibit elegance and wit. His delineations of the parasite were skillful. He was much admired by the Romans. See the edition by Hirschig (1840) and that of Meineke, in his *Fragmenta Comico-rum Græcorum*, vols. i and iii. Consult M. Rösler, *Die Fassungen der Alexius-legende, mit besonderer Berücksichtigung der mittellenglischen versionen* (Vienna and Leipzig, 1905).

ALEXIS, WILLIBALD (1798-1871). The assumed name of Wilhelm Häring, the founder of the German historical novel. Born at Breslau, June 29, 1798, he removed to Berlin, where he began a gymnasium course, but left to take part in the French campaign of 1815, returned to study law and history at the universities of Breslau and Berlin, and then after a few years as a law court official he turned to editorial duties (later on the staff of the *Vossische Zeitung*) and other literary work and to business enterprises. In 1851 he removed to Arnstadt, where after a long illness he died, Dec. 16, 1871. His wife was an Englishwoman.

His works are varied and voluminous: poems, stories, sketches, reviews, editorials, dramas, novels, tales of crime, and translations, among others Walter Scott's "Lady of the Lake," but his fame rests upon his historical novels under the influence of this English author. His first two, *Wallador* (3 vols., 1823-24) and *Schloss Avalon* (3 vols., 1827) passed for a long time as Scott's work. They were translated into English and several other languages. His best novels, based mostly upon the history of Brandenburg and Prussia, are *Cabanis* (6 vols., 1832), *Roland von Berlin* (3 vols., 1840), *Die Hosen des Herrn von Bredow* (5 vols., 1846-48), and *Ruhe ist die erste Bürgerpflicht* (5 vols., 1852). Collected works publ. 1874 in 20 vols.

He was influenced first by Ludwig Tieck and then by Scott. Although occasionally encumbered with too much mere historical detail, his best works are marked by accurate descriptions especially of North German scenery, lifelike pictures of people and times, bright touches of genuine humor, and a strongly patriotic tone. They are now, however, considered too long. His poems and dramas are inferior.

ALEXISBAD, à-lèk'sès-bät'. A watering place in the duchy of Anhalt, Germany, with an altitude of about 1000 feet. It has two kinds of springs. The Selke spring is used for bathing and contains chloride and sulphate of iron, while the Alexis spring contains carbonic acid and is used for drinking purposes. Alexisbad was established as a watering place by the Duke of Anhalt-Bernburg in 1810.

ALEXIUS. A Roman saint of the fifth century, patron of the society of Alexians or Cel-lites. He is said to have been a Roman Senator, but gave up the world for a life of poverty and celibacy. His relics are said to have accomplished marvelous cures. Alexius is honored in the calendars of the Latins, Greeks, Syrians, Maronites, and Armenians. His festival occurs on July 17. He was a favorite subject among the poets of the Middle-High-German period. Consult: Massmann, *Sankt Alexius Leben* (Quedlinburg, 1843); Paris and Pannier, *La vie de Saint Alexis* (1872); Blau, *Zur Alexislegende*, in the *Germania*, vol. xxxiii (1888), and A. Amiaud, *La légende syriaque de Saint Alexis* (1889).

ALEXIUS. The name of several Byzantine kings. See ALEXIS.

ALEY, ā'lī, ROBERT JUDSON (1863—). An American scientist and educator, born at Coal City, Ind. He attended Valparaiso College from 1879 to 1882, graduated from Indiana University in 1888, and took post-graduate studies at Leland Stanford, Jr., University and the University of Pennsylvania, receiving the Ph.D. degree from Pennsylvania in 1897. Having had experience in teaching mathematics in normal schools and colleges prior to and during his university studies, he was appointed professor of this subject at Indiana University in 1891. This position he resigned, after 18 years of service, to become State Superintendent of Public Instruction (1909), and this in turn he gave up the next year when chosen president of the University of Maine. For many years he was mathematical editor of the *Inland Educator* and *Educator-Journal* and in 1903 became editor-in-chief of the latter publication. He was made a member of many American and foreign scientific societies. His published writings include *The Geometry of the Triangle* (1897); *Graphs* (1900); *The Essentials of Algebra* (1904) and *Supplementary Problems in Algebra*—both written in collaboration with D. A. Rothrock; *Story of Indiana and its People* (1912).

AL'FA. One of the varieties of esparto (q.v.), a plant which grows in North Africa. Its fibre is valuable for paper-making.

ALFAL'FA (Sp. from Ar. *al-faḥḥaḥ*, the best feed), also called LUCERNE. A leguminous plant, widely used, especially in Europe and in parts of North and South America, as a forage and hay crop for stock. The plant (*Medicago sativa*) is a native of the valleys of central western Asia. It has been cultivated in Europe for more than 2000 years, and was introduced into Mexico and South America at

the time of the Spanish conquests. In 1854 it was brought from Chile to California, whence it spread rapidly over the semi-arid regions of the Pacific and Rocky Mountain States, where it is now extensively grown. Since then it has become an important crop in the irrigated regions of the West and is also cultivated in that section with only the natural rainfall. In the Eastern and Southern States the acreage in alfalfa has largely increased since 1900. In 1909 Kansas led in acreage and hay production, with 955,470 acres yielding 1,995,571 tons of hay. Nebraska, Colorado, and California ranked next in acreage that year, and Utah stood first in the production of alfalfa seed with 51,812 bushels.

Alfalfa is a long-lived herbaceous forage plant belonging to the clover family. It bears its small kidney-shaped seeds in spirally coiled pods with from two to three turns. The plant has an extensive root system, the taproot often being 15 or more feet long. It is adapted to a wide range of conditions, being grown from sea level to altitudes of over 7500 feet, in dry regions as well as those with copious rainfall, and in tropical climates as well as in sections having severe winters. Hardy strains, however, are required to succeed under climatic extremes.

The plant demands a deep, porous, and fertile soil, well drained, having an adequate lime content and quite free from weeds. It responds readily to soil treatment with barnyard manure, green manure, and commercial fertilizers. As alfalfa, like other leguminous crops, adds nitrogen to the soil through the nodule-forming bacteria of its roots, the commercial fertilizers used need not contain much nitrogen, but they should supply phosphoric acid and potash in liberal quantities. Where liming is required the application is best made the year before the crop is sown, a ton of unslaked lime per acre being usually sufficient. A clean soil is necessary to keep the tender young alfalfa plants from being crowded out by the weeds. The preceding crop should preferably be a fertilized hoed crop such as corn, cotton, potatoes, etc., or a green-manuring crop either turned under or harvested sufficiently early to admit of timely preparing the land for alfalfa. In preparing the seed bed the land should be plowed about 8 inches deep, put into the best of tilth, the upper 2 to 3 inches pulverized finely, and the soil allowed to settle. The plowing is done about six weeks before seeding, and the land is brought into condition by disking and harrowing. The seed is drilled or broadcasted in late summer or in the spring and covered deep enough to insure moisture for germination. From 15 to 30 pounds of seed are usually sown per acre, the quantity being governed by the type of soil and the moisture conditions. Alfalfa is sometimes sown with a nurse crop, but this is not generally recommended. The inoculation of the soil to insure the presence of the nodule-forming bacteria is effected by transferring soil from an alfalfa field producing the nodules abundantly on the roots of the plants or by treating the seed with pure cultures of the particular bacteria. Soil in which sweet clover or bur clover is growing can also be used. Where the culture of the crop is of long standing, the land is usually sufficiently inoculated. For hay alfalfa is cut when the plants are coming into bloom, and again from two to six times, according to the character of

the season. The annual yield of hay varies from three to six or more tons per acre.

Alfalfa is used as a soiling crop, as pasturage, and in the form of silage and hay, and is fed to dairy cows, beef cattle, sheep, hogs, horses, and poultry. It is also an excellent honey crop for bees. The green product has the following percentage composition: water, 71.8; protein, 4.8; ether extract, 1; nitrogen free extract, 12.3; crude fibre, 7.4; and ash, 2.7. When cured as hay, the average percentage composition is: water, 8.4; protein, 14.3; fat, 2.2; nitrogen free extract, 42.7; crude fibre, 25, and ash, 7.4. The different crops and cuttings do not vary greatly in composition. When alfalfa flowers begin to appear, the stalk constitutes about 50 or 60 per cent, and the leaves 40 or 50 per cent of the whole plant. At the usual time of cutting, alfalfa leaves contain one-third more of the total dry matter of the crop. The leaves contain from one-quarter to one-third as much crude fibre as the stalks, and from two to three times as much albuminoids. As shown by experiments with cattle, the following percentage amounts of the ingredients are usually digested: 60.7 per cent of the total organic matter, 72 per cent of the protein, and 69.2 per cent of the nitrogen free extract. Of the crude fibre of alfalfa hay, about 46 per cent is on an average digestible. Chemical analysis and digestion experiments show that alfalfa compares very favorably with red clover, both as green fodder and as hay. When fed as a soiling crop, it should be partially wilted or mixed with hay or straw. In dry regions of the West it is much used for pasturage, especially in the fall, but there is always more or less danger of its causing the cattle to bloat or of the plants being killed by too close pasturage.

Alfalfa Diseases and Enemies. The diseases generally attacking alfalfa affect either the roots or the stems and leaves. Of the root diseases, root-rot (*Ozonium omnivorum*) is most prevalent and destructive, destroying the stand completely as it spreads in almost perfect circles. Land infested with root-rot should be used for other crops than alfalfa for several years in order to get rid of the disease. Of the diseases attacking the leaves and stems the leaf spot (*Pseudopezia medicaginis*) is the most common. It usually occurs on the leaves of the older plants and may be recognized by the minute brown spots of irregular shape on the green or discolored leaflets. Leaf-rust (*Uromyces trifolii*), powdery mildew (*Erysiphe trifolii*), downy mildew (*Peronospora trifolii*), and another leaf-spot disease (*Macrosporium sarcinæforme*) are also destructive, and the most effective remedy is to mow the crop as soon as these diseases appear to become troublesome. Anthracnose (*Colletotrichum trifolii*) is locally destructive. Alfalfa is also attacked by a parasitic flowering plant known as dodder (q.v.). Animal pests such as gophers, prairie dogs, and mice often cause considerable damage, and in parts of the Western United States an insect known as the alfalfa weevil is very injurious to the crop. In the semi-arid sections grasshoppers often are troublesome.

Bibliography. J. M. Westgate, "Alfalfa," *United States Department of Agriculture, Farmers' Bulletin 339* (Washington, 1908); H. D. Hughes, "Alfalfa Management in Iowa," *Iowa Experiment Station Bulletin 137* (Ames, Iowa, 1913); F. D. Coburn, *The Book of Alfalfa* (New York, 1906); J. E. Wing, *Alfalfa in Amer-*

ica (Chicago, 1910). See also ALKALI SOIL, *Bibliography*.

AL-FARABI. See FARABI.

ALFELD, älf'fält. A town of Prussia, pleasantly situated in a mountainous district at the base of the Sieben Berge, a group of hills, on the Leine, 27 miles south of Hanover. Its industries include the manufacture of paper and farm machinery, and there are iron works. Pop., about 6000.

ALFIERI, àl-fyā'rè, CESARE, MARQUIS DI SOSTEGNO (1796-1869). An Italian diplomat and statesman, a kinsman of Vittorio Alfieri, the poet. He was born at Turin, Aug. 13, 1796, and, having early devoted himself to affairs of State, was successively Secretary of the Sardinian legations at Paris, The Hague, St. Petersburg, Berlin, and Florence. Returning to Turin in 1831, he was associated with Cavour. When the Reform Commission was appointed, Alfieri became its president, and accomplished much for the elevation of universities and for advanced study in general. He was for a very short time in 1848 Prime Minister, then Vice President of the Senate, and, from 1856 to 1860, its President. He died at Florence, April 16, 1869.

ALFIERI, VITTORIO, COUNT (1749-1803). The most important of the Italian dramatic poets, a younger contemporary of Metastasio and Goldoni, a man as unique in his personality as in his writings, and held in honor to-day by his countrymen less for the tragedies which first made him famous than as the reviver of a national spirit in modern Italy. The salient facts of his life are known mainly through his *Autobiography*, a work exceptional in its class for its frank sincerity and keen personal interest. He was born Jan. 17, 1749, at Asti, in Piedmont, which in those days was looked upon by the mass of Italians almost as alien territory. Of the misspent youth which he afterward so keenly regretted, eight years were passed in the Academy of Turin—years of "uneducation," he calls them. Eight years more were equally wasted in roving through France, England, and Holland, and in an idle and dissolute life in Turin. It was not until his twenty-sixth year and his fourth serious infatuation—this time for a certain Marchesa Turinetti di Prie—that he felt himself inspired with lofty aims, and especially with a desire to make a name for himself in the field of dramatic poetry. Under this inspiration he made his first dramatic essay, some scenes of a *Cleopatra*, resumed his serious studies, and removed to Florence in order to perfect himself in the correct Tuscan idiom, for his Italian at this time was scarcely better than his French. In Florence he first met the Countess of Albany, the unhappy wife of Charles Edward Stuart, and formed for her that life-long attachment which he defined as a "degno amore" and which has become historic. After her separation from her husband in 1780, Alfieri joined her for a time in Rome, and after the Pretender's death was seldom separated from her during the remainder of his own life. There is, however, no ground for believing that they were secretly married. For several years they lived in Paris, but narrowly escaped in the Reign of Terror and, being forced to flee, took refuge once more in Florence. Here Alfieri died, Oct. 8, 1803, and here, in the church of Santa Croce, the Countess caused a monument to be erected by Canova to his memory.

Besides his tragedies and autobiography, Alfieri's literary activity produced numerous son-

nets and odes, his *Misogallo*, a fierce denunciation of France, in mingled prose and verse, some unimportant prose writings, and six comedies, four of which, *L'Uno*, *I Pochi*, *I Troppi*, *L'Antidoto*, form a political tetralogy intended to show that the best government is that founded upon the will of the people. The series of tragedies began with *Cleopatra*, first produced at Turin in 1775 and continued until 1789. The most important are *Virginia*, *Agamennone*, *Oreste*, *Timoleone*, *Maria Stuarda*, and *Saul*, which is still regarded as his masterpiece. They are all obviously cast in one and the same mold, and that a narrow one; all classically correct, yet full of dignity and lofty sentiments. The principles which he laid down he rigidly followed. He did not permit himself to imitate or even to read Shakespeare; but adhered to the model of Greek and French tragedy, and followed to a large extent the classic unities. A tragic subject, in his opinion, was one which permitted a powerful excitation of good or evil passions; his own themes were regularly drawn from some stirring event of history or mythology. His highest aim was to unite "artistic truth with moral truth, beauty with morality." He wished the theatre to be "a school in which men might learn to be free, brave, and generous, inspired by true virtue, intolerant of violence, full of love for their country, with a true knowledge of their personal rights, and in all their passions enthusiastic, upright, and magnanimous." It was Matthew Arnold who summed up Alfieri as "a noble-minded, deeply interesting man, but a monotonous poet"; but his poetry was not found monotonous by his own or the following generation. What he did for tragedy was carried on by Monti, by Foscolo, by Pellico, and others. What he did for Italian unity is harder to measure. An entire generation of patriots was inspired by his *Virginia* and *Brutus* and *Timoleone*, and drew freely upon them for passages with which to inflame their hearers. His persistence in regarding himself primarily a native of Italy, and in speaking and writing in classic Tuscan, bore special fruit in his native Piedmont. In the words of his fellow-countryman, Gioberti, "the revival of civil order throughout the peninsula, the creation of a laic Italy, is due to Vittorio Alfieri, who, like a new Dante, was the true secularizer of the spirit of the Italian people and gave to it that strong impulse which still lives and bears fruit."

The complete edition of Alfieri's works is that published at Pisa (1805-15), in 22 volumes. The first edition of the tragedies is that of Siena (1783), containing only 10 tragedies. Good editions of selected tragedies are those edited by G. Falorsi (Florence, Barbera), Pisaneschi (Turin, Paravia), and Trevisan (Verona). For biographical and critical details, consult: *Autobiography*, translated by Lester (New York, 1845); Centofanti, *Tragedie e vita d'Alfieri* (Florence, 1842); Copping, *Alfieri and Goldoni: Their Lives and Adventures* (London, 1857); Howells, *Life of and Essays on Alfieri* (Boston, 1877); Antonini and Cognetti, *Vittorio Alfieri* (Turin, 1898); G. Carducci, *Primi Saggi* (Bologna, 1889); and E. Panzacchi, *Vita italiana nel settecento* (Milan, 1896); Dole, *Teacher of Dante and Other Studies in Italian Literature* (New York, 1908), and Holland, *Builders of Modern Italy* (New York, 1908). Available editions of the important *Vita* alone are those of London, 1807 (2 vols.), and Florence, 1822. See also the edition of the *Vita* annotated by Arturo Linaker,

a second edition of which appeared at Florence, 1905.

ALFILARIA, ăl-fil'ă-rĕ'ă. See GERANIUM.

ALFINGER, ăl'fĭng-ĕr, AMBROSIODE (?-1532). A German soldier of fortune, who in 1528 became the agent of the Welser family of Augsburg, to finish for them the conquest of Venezuela; this being the condition under which they held title to the country from Castile. He led out a company of Germans, but his expedition to the neighborhood of Lake Maracaibo and to New Granada was notorious for its cruelties, and he was killed by an Indian.

ALFIO'NA (Mex. Sp.). The largest of the California surf fishes. See SURF FISH.

ALFONSINE, ăl-fŏn'sĭn, or **ALPHONSINE TABLES**. A revision of the planetary tables of Ptolemy made by the ablest Christian, Jewish, and Moorish astronomers in Spain for Alfonso X (the Learned) of Castile. The many imperfections of the Ptolemaic Tables, due to the erroneous values of the length of the year and of the precession of the equinoxes employed by Ptolemy, had become more and more manifest with the increasing accuracy of astronomical knowledge, and had rendered such a revision necessary. The work was begun in 1248 and was completed at the enormous cost of 400,000 ducats, it is said, in 1252, the year of Alfonso's accession to the throne. The tables were printed for the first time in 1483 in Venice. They were held in only moderate esteem by later astronomers, and Tycho Brahe is said to have deplored the waste of money involved in their compilation.

ALFON'SO I OF CASTILE and VI OF LEON, "the Valiant" (1030-1109). He was the son of Ferdinand the Great, King of Castile and Leon. Leon was given to him by his father; Sancho, the eldest son, received Castile; Garcia, youngest of the three, a part of Galicia and Portugal. Alfonso came to the throne in 1065. War soon broke out between the brothers, and in 1068 Sancho defeated Alfonso in a bloody battle on the Pisuerga. Three years later Alfonso defeated Sancho on the Carrión; but Sancho, reënforced, it is said, by the renowned Cid, Roderigo Diaz de Bivar, nearly annihilated the Leonese army, took Alfonso prisoner, compelled him to abdicate, and shut him up in a monastery. Alfonso escaped and sought shelter with the Moorish King of Toledo. Sancho took possession of Leon and immediately attacked Garcia, defeating and capturing him at Santarem. In 1072 Sancho was assassinated by a Castilian knight, and Alfonso, upon solemnly declaring himself innocent of the murder, was reinstated in his kingdom of Leon, to which was added Castile. His brother Garcia, King of Galicia, was preparing to attack him, but was treacherously invited to his court, made a prisoner, and died in confinement 10 years later. Alfonso now ruled over nearly all of his father's kingdom, and went to the assistance of the Moorish King, who had befriended him and whose kingdom was being invaded by Cordovans. Alfonso's gratitude ended with the death of the old King; he did not scruple to attack his son, and soon captured the city of Toledo, thus adding New Castile to his dominions. Alfonso was monarch of most of Christian Spain, when a powerful Almoravide army from Africa, with the assistance of the King of Seville, inflicted upon him a terrible defeat, in 1086, near Zalaca. He gradually regained strength, but in 1108 the Moors defeated

him and killed his only son. The next year Alfonso died and was succeeded by his daughter, Urraca, who became the wife of Alfonso I of Aragon. His illegitimate daughter, Theresa, married Henry of Burgundy, and gave birth to the first King of Portugal.

ALFONSO I OF NAPLES AND SICILY. See ALFONSO V OF ARAGON.

ALFONSO I (?-1134). King of Navarre and Aragon, who succeeded Pedro I in 1104. His marriage with Urraca, heiress of Alfonso VI, of Leon and Castile, brought that kingdom under his sway. Misunderstandings soon arose with Urraca, and a divorce was granted. Alfonso, however, continued to fight against Castile, thus prolonging the final strife with the Moors. He was called "emperor" and "fighter"; the latter name he won by his victories over the Moors. In 1114 he began the siege of Saragossa, which he captured four years later. In 1120 he slew 20,000 Moors on the field of Daroca. In 1123 he invaded Valencia and two years later he went to the aid of the Christian Moors in Andalusia. In 1130 he crossed the Pyrenees and captured Bordeaux and Bayonne. In 1133 he besieged Fraga on the Cinca. The contest was long and severe, bringing from Africa 10,000 Almoravides. Finally, however, the Christians were defeated. Alfonso died in 1134.

ALFONSO (Port. *Affonso*) I (1094-1185). King of Portugal, son of Henry of Burgundy, conqueror and Count of Portugal. His father died when he was about two years old, and the management of affairs fell into the hands of his ambitious and dissolute mother, Theresa of Castile, from whom he was compelled to take it by force on attaining his majority. He was forced into war with Castile, whose supremacy he did not recognize. He then attacked the Moors and won a brilliant victory on the plains of Ourique (1139), where, according to the legend, 200,000 Moors perished. From that day he took the title of king. He was crowned by the Archbishop of Braganza, and the coronation was sanctioned by the Pope in 1169. On Oct. 23, 1147, he took Lisbon, with the aid of some English crusaders under William Longsword, on their way to the Holy Land. The booty was so rich that most of the crusaders returned home. In 1158, after a two months' siege, he became master of Alcazar de Sal. He took by assault the fortress of Santarem from the Saracens, in 1171, and annihilated the garrison; at the same place he defeated the Almohade ruler, Jusef-ben-Jakub, in 1184. He invited to his land the Knights Templars and the Knights of St. John and established the Orders of Avis and of St. Michael. He died at Coimbra, Dec. 6, 1185. He is generally regarded as a saint by the Portuguese.

ALFONSO III, surnamed "the Great" (848-912). King of Leon, Asturias, and Galicia. He succeeded his father, Ordoño I, in 866, but had to maintain his rights by force of arms. From 870 to 901 he was at war with the Moors and gained many victories. In 888 Garcia, the son of Alfonso, raised the standard of revolt. Alfonso collected his forces, conquered his son, and threw him into prison. But Garcia's mother, with the help of several of the grandees, excited a new conspiracy, which resulted in the abdication of the monarch in favor of his imprisoned son, in 910. He died at Zamora in 912. Many fabulous stories are told of him, but little is known which would justify his legendary fame.

ALFONSO V (1385-1458). King of Aragon,

Naples, and Sicily. He reigned from 1416 to 1458, receiving the surname "Magnanimous," because on his accession to the throne he destroyed a document containing the names of all the grandees who were hostile to him. He is renowned chiefly for having brought Southern Italy under the dominion of Aragon. In 1420 he attacked Corsica, but speedily hastened to Naples at the request of Queen Joanna II, who in return for his assistance against Louis of Anjou named him as her heir. For some time he enjoyed her highest favor; but in 1423, having thrown into prison her minion, Caracciolo, who was his enemy, the Queen declared for his rival, Louis. At her death, in 1435, Alfonso resolved to claim the kingdom; but René of Anjou, whom Joanna had appointed her successor after the death of Louis, opposed him. Rome and Genoa sided with René. The Genoese fleet inflicted a most serious defeat upon the Aragonese fleet, and Alfonso was captured. He was sent to the Duke of Milan, who set him at liberty and formed an alliance with him. After several battles Alfonso overthrew his adversary and entered Naples in triumph. Having once firmly established his power, he proceeded to suppress the disorders which had sprung up during the reign of Joanna. He died at Naples, June 27, 1458.

ALFONSO V (1432-81). King of Portugal, surnamed "the African," in honor of his victories over the Moors in Algiers. At his father's death, in 1438, there was a fierce struggle for the regency between the Queen Mother and the uncles of the King. Finally the Queen was defeated and his uncle Pedro became regent. In 1448 Alfonso assumed the government; in the following year he declared his uncle a rebel, and defeated him in battle. After a campaign in Africa, Alfonso undertook to seize upon Castile and Leon, but was defeated at Toro. Alfonso endeavored to get assistance from the King of France, but, finding that he was being deceived, he abdicated in favor of his son, Juan, in 1476. He was forced, however, to ascend the throne again. In 1479 he signed the treaty of Alcantara with Castile. In 1481 he died of the plague. He founded the Order of the Tower and Sword under the invocation of San Diego. In his reign the explorations of the Portuguese along the western coast of Africa were pushed beyond the equator.

ALFONSO VI OF LEON. See ALFONSO I OF CASTILE.

ALFONSO VI (1643-83). King of Portugal. Paralyzed at the age of three, and neglected by his mother, the Queen Regent, the Prince developed into a dissolute king. He drove his mother from the court, but was himself the victim of a plot between his wife and his handsome brother Dom Pedro. Alfonso was dethroned and imprisoned (1668), and Dom Pedro took his place as King of Portugal, and, after the death of Alfonso, as husband of his Queen.

ALFONSO X (1221-84). King of Leon and Castile, surnamed "the Astronomer," "the Philosopher," or "the Wise" (*El Sabio*). He succeeded his father, Ferdinand III, in 1252. As early as the storming of Seville, in 1248, he had given indications of his courageous spirit. But instead of wisely confining his efforts to the conquest of the Moors and the repression of the nobility, he lavished the resources of his kingdom in efforts to secure the imperial throne of Germany, to which he was elected in 1257.

Richard of Cornwall was chosen in opposition to him. Neither could succeed in securing recognition, and ultimately the imperial crown was placed upon the head of Rudolph of Hapsburg (1273). While Alfonso was striving for the crown of the Holy Roman Empire, his throne was threatened by the turbulence of the nobility, and at the same time he had to contend with the Moors. The latter, however, he defeated, in 1262, in a bloody battle. In 1270 an insurrection broke out in his dominions, at the head of which was his brother Philip. Later his son Sancho also rebelled and in 1282 deprived him of his throne. He now sought the help of the Moors, but after fruitless efforts to recover his power, he died at Seville, April 4, 1284. He was the most learned prince of his time and has acquired lasting fame through the completion of the code of laws called the *Siete Partidas*, which 200 years later became the law of the land. There are still extant several long poems of his, a work on chemistry, *El libro del tesoro*, translated later by Brunetto Latini (q.v.), and various translations of Arabic works. He labored much to revive knowledge, increasing both the privileges and professorships of the University of Salamanca. He sought to improve the Ptolemaic planetary tables, whose anomalies had struck observers even at that early time. For this purpose, in 1240, he assembled at Toledo upward of 50 of the most celebrated astronomers of that age. His improved tables, still known under the name of the Alfonsine Tables, were completed in 1252. See ALFONSINE TABLES.

ALFONSO XII (1857-85). King of Spain. The son of the deposed Queen Isabella II. He was born at Madrid and was proclaimed King Dec. 30, 1874. On Jan. 23, 1878, he married Princess Maria de las Mercedes (youngest daughter of the Duc de Montpensier), who died soon after. In 1879 he married Archduchess Maria Christina of Austria, by whom he had three children. Returning from an informal visit to Germany, 1883, he was publicly insulted in Paris, and war with France was for a few days thought probable. Alfonso's reign was, on the whole, commendable. His posthumous child, Alfonso XIII, succeeded him.

ALFONSO XIII (1886—). King of Spain. He was born May 17, 1886, the posthumous son of Alfonso XII and of Maria Christina, Archduchess of Austria, who was appointed regent during his minority. The early reign of the young king was marked by mutinies abroad, while at home dissatisfaction found expression in cabinet crises and military insurrections, labor riots, and anarchistic disturbances. The unfortunate war against the United States led to the practical annihilation of Spain's colonial empire. The King assumed personal charge of the government on attaining his sixteenth year (1902). His frank and courageous though somewhat impulsive nature gained him the affection of the nation. On May 31, 1906, he married Princess Ena, daughter of the late Prince Henry Maurice of Battenberg and Princess Beatrice, daughter of Queen Victoria. On their wedding day the royal pair narrowly escaped death in a bomb explosion, the work of anarchists, which killed a score of persons about the King. As a result of this attack several nihilists were brought to trial, among them a prominent educator, Francisco Ferrer. Ferrer was summarily executed, and the King and his government became the subject of much bitter criticism. He

has, however, in general, proven himself a liberal monarch, supporting steadily an anti-clerical program, and insisting at times on exercising his royal power of pardon even at the cost of losing his ministry. Several other attempts to assassinate him were made, one on April 13, 1913.

ALFONSO MARIA DI LIGUORI, mà-rě'à dâ lě-gwō'rě. See LIGUORI.

ALFORD, ălfěrd, HENRY, D.D. (1810-71). An English biblical critic and poet. He was born in London, Oct. 7, 1810, and educated at Trinity College, Cambridge. He became Fellow of Trinity in 1834, Vicar of Wymeswold, a college living, in the diocese of Peterborough, 1835; minister of Quebec Chapel, Marylebone, London, 1853; Dean of Canterbury, 1857. He was very versatile, could play and sing, carve and paint. He wrote poetry and sermons. He was a literary critic and editor. But his reputation rests upon his edition of the Greek New Testament, in which for the first time the treasures of German linguistic and exegetical studies were introduced in comprehensive fashion to those unfamiliar with German. It was begun in 1845, and the fourth and last volume published in 1861. For the day it was a great service. He enabled the mere English reader to reap a great part of his harvest by his *New Testament for English Readers* (4 vols., London, 1868). Other of his writings have had much vogue, especially his poetry, *The School of the Heart, and Other Poems*, etc., which is characterized not so much by depth or originality as by freedom from affectation, obscurity, or bombast. Among his latest writings was *A Plea for the Queen's English* (6th ed., 1880), which excited considerable discussion. He also published several volumes of sermons. He died at Canterbury, Jan. 12, 1871. Consult *The Life of Dean Alford*, by his widow (London, 1873).

ALFRED. A village in Allegany Co., N. Y., 12 miles southwest of Hornell, on the Erie Railroad (Map: New York, C 3). Alfred was settled in 1807 and was incorporated in 1887; it is known principally as the site of Alfred University (q.v.). The New York State School of Clay Working and Ceramics and a State School of Agriculture are also here. The village has a Carnegie library, a museum, and owns its water works. Pop., 1890, 786; 1900, 786; 1910, 759.

ALFRED, or **ÆLFRED**, THE GREAT (848-900). King of Wessex from 871 to 900. He was born at Wantage, in Berkshire, in 848. His father was Æthelwulf, King of the West Saxons. Alfred, the youngest of five sons, succeeded to the throne in 871, on the death of his brother Æthelred. His reign, which lasted nearly 30 years, is noteworthy, first, because of the wars with the Danish invaders; second, because of the interest which the King took in education. Before discussing his real achievements, however, it may be well to speak briefly of some things erroneously attributed to him. In the popular legends he has been regarded as the author of many reforms and institutions which were in no way due to him. His real and great merits have been overlooked because of the actions incorrectly credited to him. Except for the false statements in many secondary works, it would be unnecessary to say that he did not institute trial by jury and that he was not the founder of the University of Oxford. The picturesque tales of his hiding from the Danes, of

the burned cakes, and of his visit to the Danish camp disguised as a harper, are inventions of a later age.

Alfred became King in the midst of a Danish invasion. After several battles he was able to make peace with the enemy, probably by paying them money. In the following years there was peace, but in 876 the marauding expeditions began again, and by the beginning of 878 the Danes were successful almost everywhere and met with no general resistance. About Easter, 878, Alfred established himself at Athelney and gathered there all the forces that he could. Several weeks afterward he marched to Brixton, gathering troops as he went, and in the battle of Ethandun, probably Edington in Wiltshire, he defeated the Danes and captured their stronghold. The Danish King Guthrum was baptized, and the peace of Wedmore followed. There were some less important engagements in the following years, but on the whole, for the next 14 years Alfred was able to give his time to the internal affairs of his kingdom. In 892 (or 893) the Danes, who had been driven away by Arnulf (q.v.), King of Germany, made a descent upon England. For four years the warfare went on almost continuously, but at last the Danes were driven off—some to Northumbria, some to East Anglia, and others to the Continent. These Danish invasions had an important influence on the history of England. By crushing the individual kingdoms, they worked, unwittingly, for the unity of England. Alfred, by withstanding them successfully, made his kingdom the rallying point for all the Saxons and prepared the way for the eventual supremacy of his descendants.

Alfred was an enthusiastic scholar and a zealous patron of learning. When he came to the throne, as he himself wrote, he found little or no interest in education and few learned men. He invited to his court native and foreign scholars, of whom the best known are Asser and John Scotus Erigena. He labored himself, and encouraged others to labor, for the education of his people. The composition of the *Anglo-Saxon Chronicle* may have been due to his initiative. He himself translated works which he thought would be useful to his people, and instead of merely translating literally, he expanded or omitted portions in order to make the work more serviceable. His principal works were translations of the following: Boëthius, *Consolation of Philosophy*; Orosius, *History of the World*; and Gregory the Great, *Pastoral Care*. Of the last there is an excellent edition in the publications of the Early English Text Society. He is said to have translated, or to have had translated, the *Soliloquies of St. Augustine*. Alfred may have translated Bede's *Ecclesiastical History*, but there is much controversy concerning this, as the translation seems to be made into the Anglian dialect and not the West Saxon. If it was not the work of Alfred, it may have been made under his direction. See Miller, *The Old English Version of Bede's Ecclesiastical History*, Early English Text Society (London, 1890); Schipper, *König Alfreds Uebersetzung von Bedas Kirchengeschichte* (Leipzig, 1897).

His laws show no striking changes from the laws of earlier kings; in fact, he disclaimed originality and spoke of his work as mainly a compilation of existing laws. But they are marked by two characteristics which deserve notice: first, they are intensely religious; sec-

ond, they make no distinction between English and Welsh, as the earlier laws had done.

Alfred died, Oct. 28, 900. (The date 901 given by the Anglo-Saxon sources seems to be wrong.) But the millenary of King Alfred was celebrated on Sept. 18, 1901, at Winchester, the former capital of the Anglo-Saxon kingdom. The commemorative exercises were participated in by many distinguished men from all English-speaking countries. On September 20, the day of the most important functions, all the delegates joined in a great procession and marched to the site where the colossal statue of Alfred, the work of Thornycroft, was unveiled, and the oration was delivered by Lord Rosebery.

In the United States the Society of American Authors encouraged the celebration of "the one thousandth anniversary of the founder of the Anglo-Saxon race." Exercises were held on October 28 in libraries and schools in various cities. The chief celebration was in New York City, where Alfred Bowker, the Mayor of Winchester, was the guest of honor.

Bibliography. The great contemporary sources of information for Alfred's life are Asser's *Life of Alfred* and the *Anglo-Saxon Chronicle*. Of each of these there are several editions in the original Latin; translations can be found in the Bohn Library; in Stevenson's *Church Historians of England*, and elsewhere. The genuineness of Asser's work has been the subject of much controversy, but most scholars now believe it to be a contemporary work, with some later interpolations.

Of secondary works Pauli's *König Alfred*, edited by Thomas Wright, is still deserving of mention. The constitutional events of the reign are described in Stubbs, *Constitutional History*, vol. i (Oxford, 1891). The millenary celebration caused the production of many books and articles. Of these the following may be mentioned: Plummer, *Life and Times of Alfred the Great* (Clarendon Press, 1902); Earle, *The Alfred Jewel* (Clarendon, 1901); Bowker, *Alfred the Great* (London, 1899), which contains seven special studies by Sir Walter Besant, Sir Frederick Pollock, Frederic Harrison, and others; Conybeare, *Alfred in the Chronicles* (London, 1900); Draper, *Alfred the Great* (London, 1901); Harrison, *Writings of King Alfred* (New York, 1901); Hughes, *Alfred the Great*, new edition (London, 1901); Jeffery, *A Perfect Prince, The Story of the England of Alfred the Great* (London, 1901); Macfayden, *Alfred the West Saxon* (London, 1901); Wall, *Alfred the Great: His Abbeys of Hyde, Athelney, and Shaftesbury* (London, 1900); Snell, *Age of Alfred* (New York, 1912); Greswell, *Story of the Battle of Edington* (Taunton, England, 1910).—Mr. Slade, of the Library of Congress, has prepared a bibliography of Alfred, which aims at completeness; consult also the bibliography in Wülker, *Grundris zur Geschichte der Angelsächsischen Litteratur*, pp. 386–451 (Leipzig, 1885).

ALFRED OF BEVERLEY (born c.1100). An old English chronicler, about whom little is known. He describes himself as treasurer and sacristan of the church of Beverley, in Yorkshire, where he wrote in Latin a chronicle history of Britain, from the fabulous period down to 1129, called the *Annales* (in nine books). It is mostly a compilation. An inferior MS. was printed by T. Hearne (1716).

ALFRED UNIVERSITY. A non-sectarian American university, at Alfred, N. Y., organized

as a school in 1836 and as a university in 1857. Its total endowment, including equipment, etc., is about \$500,000. The library has 25,000 volumes. The campus covers 16 acres, containing 14 university buildings, including a new library building valued at \$30,000, the gift of Andrew Carnegie. The university has collegiate, industrial mechanics, fine arts, music, theological and preparatory departments, a State school of clay working and ceramics, and a State school of agriculture. Instructors (1912) 42, students 447. President, Rev. B. C. Davis, Ph.D.

ALFRETON, ăl'fēr-ton. An old market town of Derbyshire, England, about 12 miles by rail north of Derby (Map: England, E 3). Its foundation is ascribed to Alfred the Great. It is a flourishing manufacturing town, and its industries include pottery works, collieries, and iron foundries. Pop., 1891, 15,400; 1901, 17,505; 1911, 19,049.

ALFURESE, ăl'fōō-rēz' or ăl'fōō-rēs', **ALFURU**, ăl'fōō'rōō, or **ALFORA**, ăl'fō'rā (Ar. *al*, the + Portug. *fora*, outside, thus probably meaning 'the outsiders'). In Celebes, the Moluccas, etc., a term applied to the tribes, of the interior especially, who seem to differ from the more or less prevalent Malay type, being perhaps pre-Malay aboriginals. The name can hardly have, however, any strict anthropological connotation. In Celebes the Alfurese are found chiefly in the north, in Gilolo in the central regions, while in Ceram they are the predominant race. The Alfurese of Celebes are probably not so different from the Malaysians as has hitherto been believed, being a mixed race. The Alfurese of Gilolo were considered by Wallace the true aborigines of the island; and some of those of Ceram, etc., are of Papuan stock at bottom. There are, evidently, several kinds of Alfurese (the word has somewhat the sense of our "gentile," "pagan"), some Malays doubtless, others pre-Malay, still others of Papuan affinities. See **CELEBES**; **MOLUCCAS**.

ALGÆ, ăl'jē (Lat. nom. pl. of *alga*, 'sea-weed'). A group of chlorophyll-bearing or colored Thallophytes. The Algæ are contrasted with the Fungi, which latter are devoid of chlorophyll. The presence of chlorophyll enables the Algæ to manufacture their own food; therefore they are independent plants. The Fungi, lacking chlorophyll, are dependent plants, obtaining their food as parasites or saprophytes. The Thallophytes (the lowest great division of the plant kingdom) include many organisms which cannot be referred to either Algæ or Fungi. There is an obvious relationship between the Algæ and the Fungi (q.v.), the latter probably having been derived from the former.

Classification. The Algæ are divided into three great groups, viz., Green Algæ (*Chlorophyceæ*), Brown Algæ (*Phæophyceæ*), and Red Algæ (*Rhodophyceæ*). Under the scientific names there will be found accounts of their general habits and most striking characteristics. From the names of these groups one might imagine that they are distinguished by color marks; but in reality fundamental morphological characters form the basis of the classification. Although it is convenient to think of the Algæ as distinguished by their color, there are many exceptions to the rule, and color should never be regarded as the foundation of the classification.

Chlorophyceæ. The Green Algæ usually contain no pigment in addition to chlorophyll. They

include the simplest Algæ and are supposed to represent the group from which the higher plants have been derived. Usually six orders are referred to this group, but some of them are very artificial, and further knowledge will doubtless dispose of them differently. Nevertheless, this grouping is convenient and assists one in keeping the facts in mind. The most primitive order is called Volvocales and is characterized by its motile vegetative cells, which swim freely by means of cilia. So animal-like is their appearance that they are often regarded as animals and referred to the Flagellates (q.v.).

The most primitive of the Volvocales are single, isolated cells; but the higher Volvocales are characterized by colony formation, i.e., the association of cells (individuals) in a colony of definite form and structure. Colony formation reaches its extreme expression in *Volvox*, a globular colony comprising thousands of cells and visible to the naked eye. The cells of Volvocales under certain conditions produce swimming spores (*zoöspores*), which are really only small vegetative cells. Under other conditions sexual cells (*gametes*) are produced, which are really only very small zoöspores. These gametes pair and fuse, producing a single, thick-walled cell (fertilized egg), which is a protected cell and starts new generations at the beginning of the next growing season. Among the lower Volvocales the gametes are alike, so that there is no visible distinction of sex; but in the higher Volvocales the pairing gametes have become very much unlike in appearance and behavior, one of them being a large and passive cell (*egg*), the other a small and active cell (*sperm*). In this group, therefore, one can see the origin of sex (gametes from zoöspores) and the differentiation of sex (eggs and sperms). Under certain conditions the motile vegetative cells of the Volvocales lose their cilia and pass into a motionless condition. This temporary condition among Volvocales becomes the permanent condition in the second order of Green Algæ, the Protococcales.

The Protococcales also include one-celled forms, *Pleurococcus* (one of the green slimes) being the most common example, but differing from the simple Volvocales in being a motionless cell. It is very common on damp stones, on the north (moister) side of tree trunks, on flower pots in greenhouses, etc. Like the Volvocales, however, the Protococcales also tend to colony formation, the extreme expression of this tendency being *Hydrodictyon* (water-net), a remarkable colony, forming hollow nets sometimes a foot long. The simple *Pleurococcus* forms reproduce only by vegetative multiplication; i.e., the solitary cell divides to form two new cells or individuals. Among the higher Protococcales, however, swimming spores are formed and also gametes, but differentiation of sex is not attained.

The third order, Confervales, was probably derived from the simpler Protococcales and is regarded as the representative order of Green Algæ. It is also thought to be the genetic order, i.e., the order that has given rise to the higher plants. Its features in general are a filamentous body of many cells and an abundant formation of zoöspores. In the lower stretches of the order the body is a simple filament, but later it becomes a profusely branching filament, and in some cases a sheet of cells, as in *Ulva*, the sea-lettuce. The notable feature of the order, however, is the evolution of its sexual char-

acters. In *Ulothrix* there may be seen every gradation between zoöspores and gametes, so that it is obvious that gametes are simply very small zoöspores. This plant is much used, therefore, to illustrate the origin of sex. In *Ædogonium*, however, the gametes are differentiated into large eggs and small sperms. In both cases the gamete-producing cells are ordinary vegetative cells, which are transformed into sex organs by certain conditions. The most remarkable and suggestive form among the Confervales is *Coleochæte*, whose body is a sheet or mass of cells, and which represents a form from which the liverworts (Bryophytes) might have been derived. Not only does it produce eggs and sperms, but the fertilized egg, instead of producing a new *Coleochæte* plant, forms a small body containing spores (spore-case), and these spores produce the new *Coleochæte* plants. This is a suggestive appearance of the alternation of generations (q.v.) which characterizes the higher groups of plants.

The fourth order, Siphonales, was certainly derived from the Confervales, and is characterized by its cœnocytic body, i.e., a body in which there are no cross-walls, and which is therefore one continuous cavity. The connection with Confervales is indicated by the fact that some Confervales (as *Cladophora*) are incompletely cœnocytic, cross-walls occurring, but the cells containing many nuclei. When completely cœnocytic bodies are attained, they belong to Siphonales. This order is largely marine, and many marine forms display a very highly differentiated body. A very common fresh-water form is *Vaucheria*, and it is interesting in that the gamete-producing cells are differentiated from the vegetative body, so that the oogonium and the antheridium are not transformed vegetative cells.

The Conjugales form a fifth order of Green Algæ, and their relationship to the other orders is very doubtful. *Spirogyra* is the most common representative of the Conjugales, forming green, scummy growth on the stagnant water, and hence often called pond scum. The order is unique among Green Algæ in having no swimming cells, a remarkable fact in connection with an aquatic group. No spores are produced, and the pairing gametes are brought together usually through conjugating tubes. The order is remarkable also for the form of its chloroplasts, which in *Spirogyra* are green, spiral bands, and in *Zygnema* star-shaped bodies. The Desmids are also included among the Conjugales, although they are one-celled forms with a peculiar cell structure. The Diatoms show certain resemblances to the Desmids, but their position is very uncertain.

The Charales are usually included among Green Algæ as a sixth order, but it seems clear that such a grouping is artificial, based on the pigment character of the group and not on its structure. Charales, or "stoneworts," form dense growths on the bottom of ponds, and resemble profusely branching green stems. The stems and branches have definite nodes which produce whorls of branches. The sex organs, borne at the nodes of branches, are remarkably complex, especially the antheridium, which produces thousands of biciliate sperms of high organization. The structure of the working body and of the sex organs suggests a group intermediate between Thallophytes and Bryophytes.

A group of Thallophytes has long been known as the Blue-green Algæ (Cyanophyceæ), which are not at all related to the true Algæ. They are closely related to the Bacteria, and these two groups constitute the group Schizophytes ("fission plants"), very distinct from Algæ and Fungi. The Blue-green Algæ have been confused with the true Algæ simply because they contain a green pigment (possibly chlorophyll), in this case associated with a blue pigment, which together give a bluish-green tint. The structure of the one-celled body, however, is very different from that of the true Algæ. Instead of having such distinct cell organs as the nucleus and chloroplast, the cell structure appears almost homogeneous. The nuclear material is not organized into a definitely bounded nucleus, and the pigment is diffused through the general body rather than restricted to a definite chloroplast. The only method of reproduction is vegetative multiplication, a cell dividing to form two new cells, and the succession of divisions is so rapid that a single cell (individual) may give rise to thousands in a very short time. It is this very rapid succession of divisions that is referred to in the name "fission plants." The cells tend to form colonies, chiefly filamentous in form, common illustrations being *Nostoc* and *Oscillatoria*, the latter form receiving its name from the characteristic oscillating movement of the filaments. The cells are held together in colonies by the production of mucilage by the cell walls, which is so abundant in the case of *Nostoc*, that the plant occurs in nature as jelly-like lumps in which filamentous colonies are imbedded. *Nostoc* also shows a differentiation of the members of the colony, certain cells losing their contents, often enlarging, and serving as anchoring cells. By means of these cells (*heterocysts*) the colony is broken into living fragments, each fragment wriggling loose and developing another colony. This colony multiplication is distinct from cell (individual) multiplication. Blue-green Algæ endure conditions that would destroy other plants. For example, they live in great numbers in the boiling water of hot springs and geysers. This power of endurance is seen also in their near relatives, the Bacteria.

Phæophyceæ. The Brown Algæ constitute a very large and chiefly marine group, with forms ranging from simple filaments to the gigantic kelp or Devil's Apron (q.v.) and highly specialized rock weeds. This class also presents an excellent illustration of the principal stages in the evolution of sex. There are two divisions: one, whose reproductive cells, whether sexual or asexual, are swimming spores, and the other, whose reproductive cells are large eggs fertilized by swimming sperms. The motile reproductive cells of the group, whether sexless spores or gametes (sexual cells), are peculiar in being bean- or kidney-shaped, with the pair of cilia inserted laterally. There are a dozen or more orders in this group, the largest being the Ectocarpales, comprising some of the simplest filamentous forms; the Laminariales or kelps; and the Fucales, which include the rock weeds and *Sargassum*. In vegetative complexity some of the Fucales are probably the most advanced of all the Algæ. For illustration see PHÆOPHYCÆ.

Rhodophyceæ. The Red Algæ are acknowledged to be the most beautiful of all the marine Algæ, because of the delicacy of their structure and brilliancy of color. The vegetative structure is not so highly differentiated as in some of the

Brown Algæ, but the method of sexual reproduction is especially complex. The oogonium has a hair-like process ("trichogyne," q.v.) against which the sperms lodge. The contents of sperm are discharged into the trichogyne and pass into the body of the oogonium. The result is not a fertilized egg, but the oogonium (often fusing with adjacent cells to form a large chamber) buds out numerous branches that produce spores, and this whole spore-bearing structure usually becomes ensheathed by a jacket of cells. This spore-bearing structure, with or without a jacket, is the *cystocarp*, whose spores (*carpospores*) produce the new plants. The Red Algæ also develop asexual spores, which are non-motile (as are the sperms), and since they are produced in a group of four in each sporangium, they are called *tetraspores*.

The presence of Algæ in reservoirs is often a source of much annoyance, if not a source of disease. Recent experiments have shown the possibility of speedily destroying these objectionable growths by treating the storage basin two or three times during the summer with copper sulphate in such amount as to give an extremely dilute solution. Fully 100 water supply reservoirs have been successfully treated without a single instance of injury being reported. Cress beds have been freed of *Spirogyra* by using 1 part of copper sulphate to 50,000,000 parts of water. For illustrations, see articles CHLOROPHYCEÆ; CYANOPHYCEÆ; PHÆOPHYCEÆ; RHODOPHYCEÆ.

For general description of Algæ, consult: Murray, *Introduction to the Study of Seaweeds* (London, 1895); Farlow, *Marine Algæ of New England* (Salem, 1881); Cooke, *British Fresh-Water Algæ* (London, 1881-83); id., *Introduction to Fresh-Water Algæ* (London, 1902); Wolle, *Fresh-Water Algæ of the United States*.

ALGARDI, ăl-gär'dè, ALESSANDRO (1602-54). The most prominent Italian sculptor of the Baroque period after Bernini (q.v.); also an architect. He was born at Bologna, where he first studied painting under Lodovico Carracci, but afterward took up sculpture with Conventui. His early works were ivory carvings and models for small silver and bronze work executed at Mantua under the patronage of Duke Ferdinand, and afterward (from 1625) at Rome. For 15 years he was then principally employed in restoring antique statues. In 1640 he was made head of the Academy of St. Luke, and in the same year he received his first important public commission, the colossal marble group of "St. Philip Neri and the Angel" in Santa Maria in Vallicella (Rome). The following year he carved his well-known "Beheading of St. Paul" for the church of San Paolo, Bologna. Under Pope Innocent X he replaced Bernini as court sculptor. In this capacity he designed the statues and reliefs on the façade of the Villa Doria-Pamfili, in Rome, the stucco ceilings of the interior, and the magnificent garden, with its fountain and casino. In 1645 he designed the colossal bronze statue of Innocent X. Among his other portraits of this Pope is an excellent bust in the Metropolitan Museum of Art, New York. About 1749 he completed the colossal tomb of Pope Leo XI in St. Peter's, and the same year he designed the great fountains of the court of Pope Damasus in the Vatican. Most celebrated of all his works is the marble relief of the "Retreat of Attila from Rome" in St. Peter's (1450), the largest alto-rilievo in the world.

Like other Baroque sculptors, Algardi conceived sculpture in the pictorial sense. His style was modeled upon Bernini's, but is more detailed in finish and dryer in textures. He excelled especially in portraiture. Though his works are of high technical ability, their effect is marred by a hollow pathos and exaggerated dramatic action. An architect of note, he designed the Villa Doria-Pamfili and the façade of Saint Ignazio in Rome.

AL'GARO'BA. See MESQUITE TREE.

ALGAROTTI, ăl'gà-rõt'tè, FRANCESCO, COUNT (1712-64). An Italian philosopher and art critic. He was born in Venice, studied at Rome and Bologna, and when 21 years old published in Paris his *Neutonianismo per le donne* ("The Newtonian Philosophy for Ladies"), a work on optics, on which his reputation was founded. Until 1739 he lived in France and for many years enjoyed the friendship of Voltaire. On his return from a journey to Russia he first met Frederick the Great, who bestowed upon him the title of Count and in 1747 made him Court Chamberlain. He also enjoyed the favor of Augustus III of Poland and lived alternately in Berlin and Dresden until his return to Italy in 1754. He died at Pisa, where Frederick the Great raised a monument to his memory in the Campo Santo. He was a versatile man and a voluminous writer. In his day he was considered a good judge of painting and architecture, and his reputation is confirmed by his *Saggi sopra le belle arti* ('Essays on the Fine Arts') and by the paintings he selected for the Dresden Gallery. His chief defect of style was the strong Gallic flavoring, due to a too faithful study of French literature. English readers are most likely to think of him as Carlyle's "young Venetian gentleman of elegance in dusky skin and very white linen." Algarotti's collected works appeared, with biography by D. Michelessi, Venice, 1791-94.

ALGAROVILLA, ăl'gà-rò-vèl'yà (Sp. *algarroba*, from Ar. *al-kharrubah*, the carob tree). An astringent product of *Pithecolobium parvifolium*, one of the Leguminosæ growing in tropical America, the pods of which are said to be four times as rich in tannin as the best oak bark. Black ink is made from it, also a yellow dye, and it is useful in medicine.

ALGARVE, ăl-gär'vã. The smallest and most southerly of the provinces of Portugal, situated between Alemtejo and the Atlantic Ocean (Map: Portugal, A 4). Its area is 1873 square miles. The northern part of the province is occupied by the Sierra de Monchique, a range of mountains with an average height of 4000 feet, which are a continuation of the Sierra Morena of Spain and terminate in Cape St. Vincent, the southwest extremity of Europe. The highest ridges are destitute of vegetation, and these mountainous regions are poorly adapted for agricultural purposes. From the main ridge the country slopes southward in jagged terraces and low hills, leaving a level tract of a few miles along the coast. The African heat of the climate is mitigated by the cool sea breeze. The only river of importance is the Guadiana, which is navigable and which separates Algarve from Spain in the east. The soil of the plain is indifferently suited for the production of grain, or even for pasturage; but it produces many kinds of southern fruit, including figs, almonds, olives, and grapes. The mineral wealth is considerable, but its exploita-

tion is insignificant. The principal occupations of the inhabitants are agriculture, cattle-raising, sea-faring, fishing, and the production of sea salt. Pop., 1900, 255,191; 1911, 274,122. The inhabitants have preserved many of the characteristics of the Moors. The chief town is Faro, with a population of about 12,000. In ancient times this province was much more extensive. It received its name from the Arabs, in whose language Algarve signifies 'a land lying to the west.' It belonged to the Moors until 1253, when Alfonso III united it to the crown of Portugal as a separate kingdom.

AL'GAZEL (*Al* is the Ar. article *the*). A gazelle; ordinarily the dorcas. See GAZELLE.

AL'GEBRA. A branch of pure mathematics that materially simplifies the solution of arithmetical problems especially through the use of equations. It also forms the introduction to all of the higher branches of mathematical science, except pure geometry.

The name is derived from the title of the Arabic work by Al-Khuwarizmi (q.v.), *Ilm al-jabr wa'l muqabalah*, meaning 'the science of reintegration and equation'; that is, the science that relates to the reduction of equations to integral form and to the transposition of terms. The title appeared thereafter in various forms, as *ludus algebræ almugrabalæque*, and *algiebar* and *almachabel*, but the abbreviation algebra was finally adopted. The science also went under various other names in the fifteenth and sixteenth centuries, as the *ars magna* (Cardan, 1545), the *arte maggiore*, the *regola de la cosa* (because the unknown quantity was denominated *cosa*, the 'thing'), and hence in early English the *cossike art*, and in German the *Coss*.

The exact limitations of algebra are not generally agreed upon by mathematicians, and hence various definitions have been proposed for the science. It has been proposed to limit it to the theory of equations, as the etymology of the word would suggest; but this has become a separate branch of mathematics. Perhaps the most satisfactory definition, especially as it brings out the distinction between algebra and arithmetic, is that of Comte: "Algebra is the calculus of functions, and arithmetic is the calculus of values." This distinction would include some arithmetic in ordinary school algebra (e.g., the study of surds), and some algebra in common arithmetic (e.g., the formula for square root).

The oldest known manuscript in which algebra is treated is that of Ahmes, the Egyptian scribe, who, about 1700 B.C., copied a treatise dating perhaps from 2500 B.C. In this appears the simple equation in the form, "Hau (literally heap), its seventh, its whole, it makes 19," which, put in modern symbols, means $\frac{x}{7} + x = 19$. In Euclid's *Elements* (about 300

B.C.) a knowledge of certain quadratic equations is shown. It was Diophantus of Alexandria (q.v.), however, who made the first attempt (fourth century A.D.) to work out the science. In the following century Aryabhata (q.v.) made some contributions to the subject. Little was then done until about 800 A.D., when Al-Khuwarizmi wrote. His efforts were followed by another period of comparative repose, until the Italian algebraists of the sixteenth century undertook the solution of the cubic equation. (See EQUATION.) In this, building upon the efforts of Ferro and Tartaglia, Cardan

was successful (1545), although there is reason to believe that the real honor belongs to Tartaglia. Soon after, Ferrari and Bombelli (1579) gave the solution of the biquadratic equation.

The principal improvements in the succeeding century related to symbolism. It took a long time, however, to pass from the radical sign of Chuquet (1484), $\sqrt[4]{10}$ through various forms, as $\sqrt[3]{10}$, to our common symbol $\sqrt[4]{10}$ and to the more refined $10^{\frac{1}{4}}$. Similarly it was only by slow steps that progress was made from Cardan's cubus p 6 rebus æqualis 20, for $x^3 + 6x = 20$, through Vieta's

$1C - 8Q + 16N$ æqu. 40, for $x^3 - 8x^2 + 16x = 40$ and Descartes'

$$x^2 \infty ax - bb, \text{ for } x^2 = ax - b^2,$$

and Hudde's

$$x \infty qx. r, \text{ for } x^3 = qx + r$$

to the modern notation. To the Frenchman Vieta, whose first book on algebra, *In Artem Analyticam Isagoge*, appeared in 1591, credit is due for the introduction of the use of letters to represent known as well as unknown quantities.

The next step led to the recognition of the nature of the various number systems of algebra. The meaning of the negative number began to be really appreciated through the application of algebra to geometry by Descartes (1637), and the meaning of the so-called "imaginary," when Wessel (1797) published his memoir on complex numbers, or, more strictly, when Gauss (q.v.) brought the matter to the attention of mathematicians (1832).

The effort to solve the quintic equation, seriously begun in the sixteenth century, had met with failure. It was only after the opening of the nineteenth century that Abel, by the use of the theory of groups discovered by Galois, gave the first satisfactory proof of the fact, anticipated by Gauss and announced by Ruffini, that it is impossible to express the roots of a general equation as algebraic functions of the coefficients when the degree exceeds the fourth.

Among the later additions to the science of algebra may be mentioned the subjects of Determinants (q.v.), Complex Numbers (q.v.), Substitutions and Groups (q.v.), Forms and the modern treatment of Equations (q.v.), and Quaternions (q.v.). Under these heads may be found historical sketches dealing with the recent developments of algebra.

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AL'GEBRA'IC CURVE. See CURVE.

ALGEBRAIC FORMS. See FORMS.

ALGECIRAS, ăl'jê-sî'ras, *Sp. pron.* ăl'nă-thê'râs (from Ar. *al-jazîrah*, the island, peninsula). A seaport of Spain, in the province of Cadiz, 6 miles west of Gibraltar (Map: Spain,

C 4). Its harbor is good and protected by a fort. It is a well-built city, with fine churches and monasteries. It maintains a brisk and profitable coasting trade, which consists chiefly of exports of leather, charcoal, cork, grain, stone, and spirits. Many of the inhabitants are engaged in fishing. Pop., 1900, 13,131; 1910, 15,818. This was the Pontus Novus of Roman times and later was the first place seized by the Moors from Africa (711). They called it Algeciras, the green island, from the islet at the harbor's mouth, still known as Isla Verde. Alfonso XI besieged it for 20 months and took it after his victory at Rio Salado, 1344. The Moors are said to have used gunpowder for the first time at this siege, at which all Christendom was represented by knights and crusaders. An international conference for the regulation of Moroccan affairs assembled at Algeciras in January, 1906. See MOROCCO.

AL'GER, HORATIO, 2D (1832-99). An American writer of juvenile literature. He was born at Revere, Mass., graduated at Harvard College in 1852, and afterward at the Harvard Divinity School. He became pastor of the Unitarian church at Brewster, Mass., in 1864; but two years later he went to New York, where he labored for the improvement of the condition of street boys. He wrote much for newspapers and periodicals and published about 70 books, of which nearly 800,000 copies have been sold. These writings include the popular Ragged Dick, Tattered Tom, and Luck and Pluck series. In 1879 he published *Grand'ther Baldwin's Thanksgiving, With Other Ballads and Poems*. A new edition of his *Works* was published in 1913.

ALGER, PHILIP ROUNSEVILLE (1859-1912). An American naval officer, born in Boston. He graduated from the United States Naval Academy in 1880 and subsequently served at sea and in the Navy Department at Washington until 1891. He was appointed professor of mathematics (on duty at Washington), and later, with the rank of captain, head of the department of mechanics at Annapolis. At the end of his period of service there, from 1899 to 1907, the department was discontinued. He was made a member of the special Naval Board of Ordnance, and Secretary-Treasurer of the United States Naval Institute. The Institute's *Proceedings* he edited after 1903. Besides articles on ordnance contributed to service journals, his published writings include *Exterior Ballistics* (1904), *Elastic Strength of Guns* (1906), and *War on the Sea* (1908).

ALGER, RUSSELL ALEXANDER (1836-1907). An American soldier and politician, born in Lafayette, Ohio. He studied law at Akron, Ohio, was admitted to the bar in 1859, and began practice at Cleveland. He removed to Michigan in January, 1860, and in September, 1861, enlisted in the Union army as a volunteer, serving successively as captain, major, and lieutenant-colonel, and being brevetted first as brigadier-general and then as major-general "for gallant and meritorious services." He returned to Michigan in 1864, where he amassed a large fortune in the lumber business. He took an active interest in both local and national politics, and was Governor of Michigan from 1885 to 1886. He became Commander-in-Chief of the G. A. R. in 1889, and in 1897 became Secretary of War in President McKinley's cabinet. His administration of the department during the Spanish-American War met with the

most vigorous criticism. He was charged with being directly or indirectly responsible for the unsanitary condition of camps, the overcrowding and unfitness of transports, the insufficiency of physicians and medicines, the bad quality of food, and the incompetence of subordinate officers. An investigating committee, appointed by the President, in the main exonerated Alger. He resigned Aug. 1, 1899. In 1902 he was appointed to the United States Senate, and in 1903 was elected to that body. He wrote *The Spanish-American War* (New York, 1901). Consult *Memorial Addresses, 59th Congress* (Washington, 1907).

ALGER, WILLIAM ROUNSEVILLE (1822-1905). An American Unitarian clergyman and ethical writer, born at Freetown, Mass., Dec. 30, 1822. He graduated at the Harvard Divinity School in 1847, held pastorates successively at Roxbury, Boston, New York, Denver, Chicago, and Portland, Me., and afterward lived in Boston. He wrote *Poetry of the Orient* (1856), *History of the Doctrine of a Future Life*, which contains a comprehensive bibliography on the subject by Ezra Abbot (1863), *The Genius of Solitude* (1865), *Life of Edwin Forrest* (2 vols., 1878), *Symbolic History of the Cross* (1881), and *The School of Life* (1881).

ALGE'RIA (Ar. *Al-jazīrah*, the island; Fr. *Algérie*). A French colony in northern Africa, situated between lat. 30° and 37° N. and long. 2° 10' W. and 8° 50' E. (Map: Africa, E 1). It is about 550 miles long from east to west and extends inland from 320 to 380 miles. Algeria is divided into Algeria Proper, or the Northern Territories, and the Southern Territories. Their combined area is 222,119 square miles. Its boundaries are formed by the Mediterranean on the north, Morocco on the west, Sahara on the south, and Tunis on the east.

Physiography. The entire northern part is traversed by a section of the Atlas Mountains, which cover the northern part of Africa from the Atlantic to the Gulf of Gabes. The mountain system of Algeria consists of two principal chains, running parallel to each other and connected by small ridges. The northern chain, called Little or Maritime Atlas, runs along the coast, in places very near the sea. Of its several ranges, the Jurjura, to the east of Algiers, rises to a height of about 7500 feet. The Great Atlas is situated south of the Little Atlas, and contains some of the highest peaks of Algeria, as Mount Shelia (about 7600 feet) in the Jebel Aures. These mountains present a steep wall toward the Sahara, but slope more gradually on their northern side, where they are covered with extensive forests. They are furrowed by deep and tortuous defiles. The Algerian Sahara is a rocky plateau, with an average elevation of about 1500 feet. Some geographers distinguish a third chain, the Sahara Border Range, situated between the Great Atlas and the Sahara Desert. The coast of Algeria is much broken, and forms numerous bays, the principal among them being the Bay of Algiers and the gulfs of Bougie and Bona.

The surface of Algeria represents three natural divisions or zones. The first, known as the Tell, is the most northern part of the country extending inland for about 50 miles and taking in the northern slope of the Little Atlas. It is the most productive and best watered part of the country, and contains most of the European settlements. The second, central zone, in-

cludes the elevated steppes south of the Tell and the Great Atlas Mountains. It is interspersed with numerous saline lakes or *shotts*, which generally evaporate during the dry season, leaving a thick stratum of salt on the bottom. In this section there are only a few little streams, which dry up for a part of the year. The third zone is the Algerian Sahara, with an uncertain area estimated at upward of 100,000 square miles. It is subdivided into three parts, called Fiafi, Kifar, and Falat, respectively. The first term is generally applied to the oases of the desert. They are mostly well watered and covered with vegetation and contain numerous thriving villages and settlements. The second refers to those parts of the desert which are covered with grass part of the year. They have no settled population, but are visited by the nomadic tribes on account of the grass. The third part includes the rest of the desert, which is utterly devoid of vegetation and unfit for human habitation. A remarkable feature of the Algerian Sahara is the dried-up river courses. At present, only two such courses are known, called the Wady Igharghar and Wady Miya, respectively. The first begins south of Algerian Sahara near N. lat. 26° and runs due north, terminating at the Shott Melrir. Its length is over 700 miles, and its breadth, even at present, is about 4 miles in some parts. The Wady Miya is a branch of Igharghar, which it joins about 60 miles south of Shott Melrir. There is still some water running beneath its bottom.

Algeria is rich in minerals. Among the metals which are obtained are iron, lead, copper, and quicksilver. Sulphur and petroleum are found, and there are valuable deposits of phosphates. Salt is a most important product. Onyx and beautiful white and red marbles are quarried.

The most important river is the Sheliff, which has in the main a westerly course and empties into the Mediterranean near Mostaganem. Its length is about 400 miles. Among other streams are the Seybouse, which empties into the Gulf of Bona, the Wady el Kebir, which flows past Constantine, and the Tafna in the extreme west. None of these rivers is navigable, but they all contribute considerably to the fertility of the regions through which they flow.

The climate is generally healthful, except in the marshy lowlands. The rainy season on the coast lands lasts from October to March. The summer is hot and rainless, with the noted *sirocco*, or desert hot wind blowing at intervals.

The mountain forests are filled with cedars and different kinds of oak, as well as pines, ashes, junipers, aloes, dwarf palms, and cactuses, but they are rapidly disappearing, giving place to pastures. The flora of the central zone is confined mainly to grasses and some aromatic herbs. Myrtles, olives, pistachias, and dwarf palms are among the characteristic plants of the northern zone. The fauna of Algeria is generally African in its character. Lions were once common, but have now vanished. The smaller carnivorous animals, like jackals and hyenas, are numerous, and antelope, deer, and wild boars are found.

Products. Algeria is chiefly an agricultural country, and its importance is increasing. For 1910 the total agricultural population was returned as 3,738,413, of whom 212,625 were European, mostly French. The soil is generally extremely fertile, and the greater part of the

area under cultivation is devoted to grain crops. The area under cultivation in 1910 was 3,512,635 hectares, of which 3,001,066 hectares were under cereals and 152,129 hectares under the vine. The total cereal production was 22,127,835 metric quintals, of which 9,763,372 were wheat, 10,361,277 barley, and 1,672,138 oats. The wine yield was 8,413,654 hectoliters. The cultivation of silk, olives, dates, and other fruits is also important, and is participated in to a considerable extent by Europeans. Potatoes, carrots, onions, and asparagus are the chief vegetables exported. Alfa grass is exported in large quantities to England. The forest area is estimated at about 2,800,000 hectares, of which over 70 per cent belongs to the State. The exploitation of the forests is considerably hindered by their inaccessibility. Much attention is given to mining, which is carried on chiefly by English firms. Among other industries are pottery, leather-dressing, weaving, and the production of esparto goods.

The commerce of Algeria is increasing. Imports, valued at 448,200,000 francs in 1907, amounted to 511,967,000 francs in 1910; while exports advanced from 338,500,000 to 513,267,000. In the latter year the imports from France amounted to 437,896,000 francs, and the exports thereto 410,367,000. After France the countries of greatest trade importance are Great Britain, Morocco, Germany, Belgium, and Spain. Imports consist chiefly of textiles, clothing, furniture, machinery, coffee, tobacco, timber, and coal. The leading exports are wine (207,698 francs in 1911), cereals (80,492,000), live stock (34,193,000), fruits (15,902,000), iron ore (12,000,000), phosphates (10,977,000), tobacco (10,047,000), zinc, cork, vegetables, wool, hides, and alfa. The total length of the railway was 2049 miles at the beginning of 1912. Algeria has, besides, a good system of national roads and about 100 miles of tramway lines. Entered at Algerian ports in 1910, 5003 vessels of 5,691,063 tons; cleared, 5198 of 5,953,639 tons; about half of the shipping is French.

The administration of Algeria is vested in a governor-general, who is assisted by a council. Under the law of Dec. 2, 1902, the governor-generalship of Algeria was divided into two parts, Algeria proper, and the Southern Territories, with separate administrations and budgets but under one governor-general. The Southern Territories were constituted out of portions of Algeria and the Sahara. Algeria proper, or the Northern Territory, comprises 80,208 square miles, with a population (1911 census) of 5,069,522; the Southern Territories aggregate 141,911 square miles, with 494,306 inhabitants; total, area 222,119 square miles; pop., 5,563,828. The population in 1906 was 5,231,850, of whom 4,477,792 were indigenous. All the laws for Algeria are framed by the French National Assembly. The three departments of Algiers, Oran, and Constantine, into which the Northern Territory is divided, have their own councils, which send delegates to the Superior Council, meeting once a year to discuss the budget. Each department sends one senator and two deputies to the National Assembly. Justice is administered by courts of first instance, of which there are 16, justices of the peace, commercial courts, and a Court of Appeals, situated at Algiers. Criminal justice is organized on the same basis as in France. For the transaction of affairs between the natives

and the Europeans or the government, there are organized so-called *Bureaux Arabes*, which also supervise the religious affairs of the natives. The military forces of Algeria number about 56,000 men, and consist of the Nineteenth Army Corps and the Territorial Army. The financial system of Algeria closely resembles that of France. The revenue is obtained from customs, monopolies, and direct taxes, the latter being the only tax paid by the natives. The budget of Algeria proper for 1912 showed estimated receipts of 145,167,014 francs and estimated expenditures of 145,155,971 francs; that of the Southern Territories 6,523,301 and 6,513,284. The military expenditure is borne by the French budget. By the law promulgated Dec. 19, 1900, Algeria was constituted a legal person, with power to own property, contract loans, grant railway franchises, award public contracts, etc.; and in the following year a decree transferred the customs department from the authorities at Paris to the governor-general. Education and religion are supported by the State. In 1910 there were 116 infant schools (with 24,889 pupils), 1443 primary schools (147,099), and 328 Mussulman primary schools. The Mussulmans have their own schools for secondary education. Lycées are found in the larger cities, and there are nine commercial schools in Algiers, as well as an institution for higher instruction, with several faculties. All religions represented were subsidized until the enactment of the Separation Law in 1905. The native population consists chiefly of Berbers (of whom the Kabyles are a part) and Arabs. The former constitute perhaps 75 per cent of the population and are the original inhabitants of the land. They have a higher standard of morality than the Arabs; they are Mussulmans, but do not practice polygamy. The Arabs are to a considerable extent intermixed with the Berbers. They inhabit chiefly the Tell region and the towns. Part of them are organized in tribes, under chiefs who are not recognized, however, by the French government. They are Mohammedan and practice polygamy. The nomadic part of the Arab population, among whom the tribal system is chiefly developed, hold land in common, each tribe being entitled to a certain territory by virtue of tradition. The non-indigenous population in 1906 numbered 680,263; of these 278,976 were French (exclusive of 170,444 naturalized French), 117,475 Spaniards, 64,645 Jews, 33,153 Italians. These figures do not include certain persons, as the military, counted apart and numbering 73,789. Negroes and Turks are found in only very small numbers. The capital, Algiers, had a population of 172,397 in 1911.

History. In ancient times the Numidians occupied eastern and the Moors (or Mauri) western Algeria. Under the Romans the former possessed the province of Numidia, the latter that of Mauretania Cæsariensis. Like all of northern Africa, these provinces enjoyed a high degree of prosperity and civilization under Roman sway, which was checked by the Vandal conquest about 440 A.D. The settlement of Arabic immigrants in the country after the Mohammedan conquest in the seventh and eighth centuries reared an Oriental civilization in place of that of Rome, and Arab princes ruled the land until the rise of the Almohades (q.v.), who governed until 1269, after which the country was split up into small states. Af-

ter the expulsion of the Moors from Spain in 1492, they settled in Algeria, and began that career of piracy against the Christian nations which gave the country its evil reputation through many centuries. Hard pressed by Spain, one of the Algerine chiefs, the Emir of Metidja, called in the Turkish corsair Horuk, known as Barbarossa (q.v.), a renegade Greek, who turned against the Emir, and made himself Sultan of Algiers. He was overthrown by the Spaniards and beheaded in 1518; but his brother, Khair-ed-Din, also known to the Christians as Barbarossa, succeeded him, repulsed the Spaniards with the assistance of a Turkish army, and established a military despotism sustained by piracy, which lasted until the French conquest. Khair-ed-Din placed the country under the suzerainty of the Turkish Sultan. The Emperor Charles V, in 1541, led a great expedition against this daring corsair, but met with disaster. In 1600 the soldiery of Algiers obtained from the Turkish Sultan the privilege of setting up an officer, called the Dey, who was to share the authority with the Turkish Pasha. The history of Algiers in the sixteenth and seventeenth centuries is a part of the history of the Barbary pirates and of the fruitless efforts of the Christian powers to suppress them. Spanish, French, English, and Dutch were equally unsuccessful. Early in the eighteenth century the Dey Ali Baba effected the virtual emancipation of the country from the dominion of Constantinople. He banished the Turkish Pasha, who had heretofore represented the Sultan, persuaded the latter to leave the power solely in his hands, and paid no more tribute.

Algeria was now ruled by a military oligarchy, at the head of which stood the Dey, and after him the powerful Turkish militia, recruited from Constantinople and Smyrna. Besides these there was a divan or Council of State, chosen from the 60 principal civil functionaries. The internal history of the country henceforth presents nothing but a bloody series of seraglio revolutions caused by the Janissaries, who permitted few of the deys to die a natural death. Algeria continued to defy the greater Christian powers, and to enforce tribute from the lesser. A final Spanish attack, made on a formidable scale in 1775, was as unfortunate as those that had preceded. During the French Revolution and the time of the Empire, its aggressions were much diminished, in consequence of the presence of powerful fleets in the Mediterranean Sea; but at the close of the Napoleonic wars they were recommenced vigorously. The first substantial rebuke was administered by a small United States squadron, commanded by the younger Decatur, which defeated an Algerine squadron off Cartagena, June 20, 1815, and compelled the Dey to acknowledge the inviolability of the American flag. About the same time Admiral Lord Exmouth, with a strong English and Dutch fleet, bombarded the capital and compelled the Dey to conclude a treaty (1816), by which all Christian slaves were released without ransom, and a promise was given that both piracy and Christian slavery should cease forever. The pledges were not kept. As early as 1817 Algerine pirates ventured as far as the North Sea, and seized all ships in their course not belonging to any of the Powers that sent them tribute, as was done by Sweden, Denmark, Portugal, Naples, Tuscany, and Sar-

inia. Treaties were of no avail. The Spanish, the Italian, and in particular the German shipping suffered severely. In 1817 the Dey Ali greatly curtailed the power of the Janissaries. His successor, Hussein, by his rash conduct brought on the conflict with France which broke the Moslem power in Algeria and made it a French province. In addition to the standing grievances against Algeria, there was a dispute regarding the payment of a debt incurred by the French government to two Jewish merchants of Algiers at the time of the expedition to Egypt. This matter had long been pending in the French courts, and as the Dey was a creditor of these Jews, he took a personal interest in the matter, and wrote to the King of France, who did not reply. At a reception of the consuls, he taxed the French consul with this, and when the latter replied that "a King of France could not condescend to correspond with a Dey of Algiers," Hussein angrily struck him.

This high crime against the dignity of nations brought the retribution which had not followed years of barbarous piracy. In 1830 the Dey and the Turks were expelled by a French fleet and a strong army under Bourmont, and the French conquest of Algeria began. The excesses of the French soldiers awoke the resentment of the native population, who regarded all restraints as removed when their Turkish masters were driven out. For 17 years the Arabs maintained a vigorous resistance to the French and after them the Kabyles, the native population of the original Berber stock, still continued the struggle in a desultory manner. The drastic measures of the French military government did not tend to pacify the people, whose antagonism was inflamed by race hatred and religious fanaticism. Bourmont was succeeded by Clausel, Berthezène, and the Duke of Rovigo, all of whom failed to master the situation. Abd-el-Kader, a young Arab emir of marked abilities and dauntless spirit, had meanwhile brought together and organized the scattered forces of rebellion and was secretly assisted by the Emperor of Morocco. A treaty was concluded with him during the provisional administration of General Voirol, and an attempt was made to promote the material interests of the country. Toward the end of 1834 there was an effort to organize the administration on a permanent civil basis, and Gen. Drouet d'Erlon was made Governor-General, but a renewed outbreak by Abd-el-Kader led to his recall and that of the military commandment. Clausel, now a Marshal, was sent back to the Regency in 1835, but had to be reënforced by Bugeaud, who made a peace with the Arab chieftain, May 20, 1837, by which Abd-el-Kader recognized the sovereignty of France, but received in return several valuable provinces. In February, 1837, Damrémont succeeded Clausel as Governor-General, and after the former's death, at the storming of Constantine, General Valée was appointed to the difficult post. In October, 1839, Abd-el-Kader violated his last treaty on an insignificant pretext, and a general attack was made upon the French positions. Bugeaud supplanted Valée in 1841, and began an inexorable and unscrupulous campaign against the Arabs with an army augmented to nearly 100,000 men. Abd-el-Kader kept up a determined fight against odds until December, 1847, when he surrendered to General Lamoricière. (See ABD-EL-KADER.) An irregular warfare

against French authority was then taken up by the Kabyles, thwarting for many years all attempts to establish civil government.

From 1858 to 1860 the military government of Algeria was superseded by the institution of a special ministerial department for Algeria and the colonies, which was first of all intrusted to Prince Napoleon. In December, 1860, however, a military government was reinstated, and Marshal Péligri made Governor-General, with a Vice-Governor under him, a Director-General for civil affairs, and a council of thirty members. In 1863 the Emperor Napoleon announced that he was willing to give the colony a new constitution, with a chamber of representatives for provincial affairs; he also addressed a letter to the Governor-General, in which he explained that Algeria was no colony in the strict sense of the word, but an Arab kingdom, and that the natives had the same right to protection as the colonists. In 1864, however, strife again arose between the colonists and the Arabs; and it was only after several engagements, during the months of April and May, that peace was restored by the submission of the conquered tribes. Péligri having died in May, 1864, Marshal MacMahon was appointed to succeed him. In the following year the Emperor himself made a journey to Algeria, and on March 5th issued a proclamation, in which, although explaining to the Arabs that the Regency must continue to be united to France, he promised to maintain their nationality and at the same time gave them assurance that they should always remain in undisturbed possession of their territories. Yet these and other measures for conciliating the Arabs were all in vain; for, shortly after the Emperor's return to France, insurrections broke out in the province of Oran and elsewhere. In 1867 and 1868 a severe and general famine checked the military enterprises of the Arabs: and there was peace till 1870, when, owing to the Franco-Prussian War, the Emperor found it necessary to withdraw to Europe the greater part of the forces in Africa. MacMahon's place was then taken by General Durieu, as interim Governor-General, and the natives began to entertain hopes of freeing themselves from the yoke of France. The last serious rebellion was suppressed in 1871. Since then, under the third republic, the industrial and political development of the country has been extremely rapid. A civil government was immediately established, which, changed and modified in 1891 and 1900, provides for the division of the colony into three departments, each sending to the French National Legislature one senator and two deputies. The local administration is conducted by a governor, assisted by a superior council, which is partly elective and partly nominated, and a democratic lower house, wholly elective. Difficult problems of land tenure and education have been manfully faced. The trade of Algeria has doubled; agriculture has been greatly diversified; the appropriation for schools more than quadrupled. Railroads have been built, and Algiers has developed into a beautiful city. The two latest problems which confront the colony both arose in 1912—the one relative to the opening of important coal mines, the other in regard to compulsory military service. Their settlement is still pending.

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ALGERINE WAR, ăl'jê-rên'. See BARBARY POWERS, WARS WITH THE.

AL GHAZZALI. See GHAZZALI.

ALGHERO, ăl-gă'rô, or **ALGHERI**, ăl-gă'rê. An episcopal city on the north coast of Sardinia, 21 miles southwest of Sassari (Map: Italy, C 7), founded by Genoese in 1102, and settled by Catalonians in the fourteenth century, who contributed the dialect now spoken by the inhabitants. It is situated on a high, rocky shore, and the harbor is fortified. There are Spanish fortifications and towers in a fine state of preservation and a cathedral dating from 1510. The Casa Albis, where Charles V stayed when he was en route to Africa in 1541, is still pointed out to visitors. Interesting caverns are near the city, the most famous of which is the Grotto of Neptune. The surrounding country produces much fruit, oil, and wine, while coral and shell fish are taken from the sea. Calcium mines have been opened and preserve factories established. Pop., 1911, 11,860.

ALGIERS, ăl-jêrz' (Ar. *Al-jazâ'ir*, the islands, referring to an island in its bay; Fr. *Alger*, ăl'zhâ', formerly ăl'zhâr'). The capital and chief seaport of Algeria, situated on the west shore of the Bay of Algiers, in lat. 36° 47' N., and long. 3° 4' E. (Map: Africa, E 1). It is located on the slope of the Sahel chain, the rich verdure of the mountains giving a beautiful background to the dazzling white of the city, which has the shape of a triangle, while over all towers the Moorish citadel or kasbah, over 400 feet above the sea. Algiers is divided into two parts. The lower part is the modern city, which has been built by the French and which differs in no respect from any well-appointed European city. It has wide and well-shaded streets, spacious squares with statues and parks, and five municipal buildings, mostly located in the Boulevard de la République. The city is lighted by gas, and the water is supplied by four aqueducts, built in the beginning of the seventeenth century. In strong contrast to the European Algiers is the old Moorish city, which rises above the former, and which, in all essentials, continues to be what it was during the reign of the Turkish deys. The streets are narrow and crooked and often impassable for vehicles. The whitewashed

stone houses present bare walls to the street, but their interiors bear the marks of splendor and beauty characteristic of Moorish architecture. The roofs are flat, and in the evening become centres of gayety and are even used occasionally for social functions. An additional picturesqueness is given to the Moorish part of the town by the motley crowds in its streets, including the elegantly dressed Frenchman, the splendidly arrayed Moor, as well as the scantily clad native from the interior. The mosques are less numerous than they were before the French occupation, when their number was estimated at about 100. At present there are only four mosques used as regular places of worship, but there are numbers of tombs of saints or "kubas," which are also used occasionally for that purpose. The construction of the citadel or kasbah was begun in 1516; this building, the palace of the deys until the French conquest, was the scene of many attacks. At present it is used as barracks for the French soldiers, and many of its historical features have been entirely obliterated. The modern city has several splendid churches, including the Roman Catholic cathedral of St. Philippe. Of educational institutions the city has schools of law, medicine, science, and letters, several lycées for the natives as well as for Frenchmen, and a number of commercial colleges and higher Mussulman schools. There are also a library and museum, two theatres, and several scientific societies. The harbor is spacious and well fortified. The commerce is very extensive, and its shipping amounts to nearly 7,000,000 tons annually. The commerce is chiefly with France; but there is also considerable export trade with Great Britain and Spain. Algiers is also one of the most important coaling stations on the Mediterranean. Owing to its mild climate and the fertile as well as picturesque country in which it is situated, the city has become a favorite health resort, and its transient population is steadily increasing. It is connected by rail with Oran and Constantine and communicates with France by steamer and cable. Since the French occupation its growth has been quite rapid. In 1838 it had a population of 30,000; 1881, 65,000; 1891, 83,000; 1896, 96,784; 1906, 138,240 (the municipal population was 145,280 and the total population of the commune, including certain persons, as the military, who are counted apart, was 154,049). Europeans numbered 105,908, of whom 50,996 were French, 23,305 naturalized French, and 12,354 Spaniards. The Jews numbered 12,490. The population, according to the 1911 census, was 153,468; municipal population, 162,326; total for the commune, 172,397. The percentage of natives is steadily declining, while the foreign population, especially the French, shows a steady increase. Algiers is the seat of the governor-general and of the superior civil and military officials of Algeria and the department and arrondissement of Algiers. The city is supposed to have been founded A.D. 944, and fell into the hands of the French, July 5, 1830.

ALGOA BAY, ăl-gô'ă. A large inlet at the southeastern extremity of Cape Colony (Map: Africa, G 8), into which the Sunday and Baasher rivers flow. Although exposed to south winds, the bay furnishes good anchorage and is of considerable commercial importance. It is known in history as the landing place of the first British immigrants to South Africa. Port Elizabeth

is situated on the west side at the mouth of the Baasher.

ALGOL, ăl'göl (Ar. *al-ghül*, the demon). A remarkable variable star in the constellation Perseus. Its variability was first noticed by Montanari in 1669, though the name of the star indicates that the phenomenon was not unknown to the Arabs. Goodricke discovered its periodicity in 1783 and suggested that it was due to the interposition of a dark satellite. Its period is 2 days, 20 hours, 48 minutes, and 55.4 seconds, and is maintained with great regularity. Ordinarily the star is of the second magnitude; but it suffers periods of diminution, lasting $4\frac{1}{2}$ hours, followed by constant minima of 20 minutes, and a return in $3\frac{1}{2}$ hours to the original brilliancy. At minimum it is of the fourth magnitude and gives only one-sixth as much light as it does in the maximum phase. Algol is the type of a class of variable stars numbering about 30, whose minimum phase is very short. Goodricke's suggestion as to the cause of the variability of Algol was the subject of a searching inquiry by Pickering, who, in 1880, announced that the observed phenomena could be completely accounted for by supposing Algol to be accompanied by a comparatively non-luminous companion-star with a diameter about three-quarters of that of the bright star, the two being engaged in mutual revolution in a period identical with the known period of variability. Pickering's explanation was confirmed in striking manner by Vogel, who found, by his spectroscopic observations in 1889, that the visible star is receding from the earth at the rate of about 26 miles per second before the minima, and approaching us at about the same rate after the minima. His approximate estimate of the dimensions of the system assigns to the distance between Algol and the dark companion a value of 3,230,000 miles and makes the diameters of the two bodies 1,061,000 and 834,300 miles respectively; their respective masses are four-ninths and two-ninths of that of the sun. The orbit is supposed to be seen nearly edgewise from the earth. Chandler's suggestion that there exists still another invisible component rests upon less reliable evidence, derived from a study of the variations in Algol's position on the sky, as observed with meridian instruments by several successive generations of astronomers.

ALGOM'ETER. See **PSYCHOLOGICAL APPARATUS**.

ALGO'NA. A city and the county-seat of Kossuth Co., Iowa, 105 miles (direct) north by west of Des Moines, on the east fork of the Des Moines River, and on the Minneapolis and St. Louis, the Chicago and Northwestern, and the Chicago, Milwaukee and St. Paul railroads (Map: Iowa, C 1). It is the centre of an agricultural, dairying, and live-stock region, and manufactures creamery supplies, foundry and machine-shop products, planing-mill products, bricks, tile, wagons, etc. The city contains a public library, opera house, and a handsome court house. The electric light and water works are owned by the city. Pop., 1890, 2068; 1900, 2911; 1905, 3047; 1910, 2908; 1913 (est.), 3300.

ALGON'KIAN SYS'TEM. In geology, that system, consisting chiefly of highly metamorphosed clastic rocks, that lies unconformably between the Archæan beneath and the Cambrian above and at the very bottom of the entire series of sedimentary rocks of the earth's crust. The name "Algonkian" was proposed by Walcott in

1889, and has been quite generally accepted by the more progressive American geologists. The rocks of this system consist of crystalline marbles, slates, schists, quartzites, conglomerates, and gneisses, all of which have, through more or less profound regional metamorphism, been derived from original sedimentary rocks, together with contemporaneous igneous intrusives and lava flows. The Algonkian system includes the Huronian and Keweenawan formations of the Lake Superior region, the Grenville series of the Adirondacks and eastern Canada, and the Hastings series of Canada. The known fossils of Algonkian age are very obscure and few in number. Because of the extensive metamorphism suffered by the rocks of both the Archæan and Algonkian systems, rendering, in many regions, their separation under the two divisions almost impossible, it is thought advisable to consider all rocks formed before the Cambrian period under the more comprehensive title **PRE-CAMBRIAN FORMATIONS**.

ALGON'QUIAN STOCK. The most widely extended and most important Indian linguistic stock of North America, formerly occupying nearly the whole area (with the exception of that occupied by the Iroquoian tribes) stretching from Labrador to the Rocky Mountains in the north, and extending southward to Pamlico Sound on the coast and to the Cumberland River in the interior. It included several hundred tribes and sub-tribes speaking probably 40 distinct languages, besides a large number of dialects. Both linguistic and traditional evidence point to the north Atlantic coast, from the St. John to the Delaware River, as the region from which the various cognate tribes migrated westward and southward. From the fact that the earliest settlements in Canada, New England, New York, New Jersey, and Virginia were all made within the Algonquin area, the history of these tribes is better known, and their languages have been more studied, than those of any others north of Mexico. According to Michelson, these languages fall into four groups, the Blackfoot, Cheyenne, and Arapaho standing apart and distinct from the remaining group. For full two centuries they opposed the advance of the white man step by step, under such leaders as Opechancano, Philip, Pontiac, and Tecumseh, with the final and inevitable result of defeat, suppression, and swift decay. The number of the Algonquian stock (1910) is about 82,000 souls, of whom about 43,000 are in the United States, the remainder being in Canada, with the exception of a few hundred refugees in Mexico.

The principal Algonquian tribes were the Algonquin, Malecite, Miami, Micmac, Naskapi, Cree, Montagnais, Abnaki, Pennacook, Massachusetts, Wampanoag, Narraganset, Mohegan, Mahican, Montauk, Lenape or Delaware, Nanticoke, Powhatan, Pamlico, Shawano, Ojibwa, Ottawa, Menominee, Potawatami, Sack, Fox, Kickapoo, Blackfoot, Cheyenne, and Arapaho. (See **INDIANS**.) Consult Truman Michelson, "Classification of Algonquian Tribes," *Twenty-eighth Annual Report Bureau of American Ethnology*.

ALGON'QUIN, frequently spelled **ALGONKIN**. An Indian tribe formerly centring about Nipissing Lake and the middle Ottawa River, Ontario. The name (more properly Algomekin) signifies people 'on the other side' of the river. French missionaries began work among the Algonquins early in the seventeenth century and soon dis-

covered their language to be the key to all the numerous dialects now included by philologists under the Algonquian stock. In consequence of destructive wars waged against them by the Iroquois, the tribe rapidly declined, some fleeing to the Upper Lakes, where, with other refugees, they became known later as Ottawas (q.v.); while others, retaining the old name, were gathered into mission villages under French protection. In 1900 there were about 960 Algonquins settled in several villages in Quebec and Ontario, exclusive of those confederated with Iroquois at the Lake of Two Mountains, in Quebec and at Gibson, Ontario, to the number of perhaps 150 more.

ALGORISM. A word variously used in arithmetic. Primarily it referred to the system of Hindu numerals, concerning which European scholars received much of their early information through the work of Al-Khuwarizmi (q.v.), or Algoritmi, as the name appeared in the mediæval Latin. Those scholars who adopted the Hindu numerals were called, from his name, Algorists, as distinct from the Abacists, who used the abacus in their computations. The word appears in various forms, as *algorithmus*, *algrim*, *augrim* (Chaucer). At present the word is generally used to designate any particular arrangement of numerical work, as the algorism for square root or the algorism for division. See ARITHMETIC.

ALGUAZIL, älgwá-thēl', or **ALGUACIL** (Sp. *alguacil*, for Ar. *al-wazir*, the vizier). The general name in Spain of the officers intrusted with the execution of justice. There are *alguaciles mayores*, who either inherit the office of executing justice in a town as a hereditary right belonging to their families, or are chosen to the office by the municipality; formerly the name was given also to the officers that executed the sentences or orders of tribunals, such as the tribunal of the Inquisition and of the various orders of knights. But usually, under the name of Alguazil, is understood the *alguaciles menores*, or 'ordinarios,' that is to say, the attendants or officers of the courts of justice, *gens-d'armes*, bailiffs—in short, all the inferior officers of justice and police who are appointed to their office by the judges, *alguaciles mayores*, or town council.

ALHAGI, älhājī. See MANNA.

ALHAMA, älä'mâ (Ar., the bath; the Roman *Astigia Juliensis*). A town of Andalusia, Spain, in the province of Granada, 25 miles southwest of Granada (Map: Spain, C 4). Its situation is wild and romantic, for it is built, terrace above terrace, upon a hill on either side of which rise naked limestone crags, while the Sierra Alhama towers to the height of 8000 feet in the background. Alhama is noted for its baths, which are much frequented in the spring and fall. They are situated in the valley of the Marchan, are of a sulphurous character, and reach a temperature of from 107° to 113° F. The Baña de la Reina is a Roman building of great antiquity; the Baño Fuerte is a Moorish structure. An earthquake in 1884 wrought much havoc, and, in consequence, the town has been largely rebuilt, modern structures replacing Moorish edifices. The principal manufactures are flour, spirits, soap, and gypsum, while the important products are grain, wine, oil, almonds, and esparto. Alhama was a watering place and fortress in the time of the Romans, and the Moors valued highly its medicinal springs. It

was, however, chiefly as a fortress and outpost to Granada that it was important to them, and when it was captured by the Christians, Feb. 28, 1492, it caused the widespread mourning expressed in the famous ballad, *Ay de mi Alhama*, well known in the English translation. Pop., 1900, 7683; 1910, 7812.

ALHAMA. A town of Murcia, Spain, situated at the foot of the Sierra de España, on the southern slope, 13 miles southwest of Murcia (Map: Spain, E 4). It is celebrated for its sulphur springs and warm mineral waters, 102° to 108° F., and is a favorite resort of invalids and holiday-seekers in spring and early summer. Fruit, especially fine grapes, is grown, and fabrics, alcohol, and saltpetre are manufactured. Copper and iron are found in the neighborhood. Alhama was known in the Roman era and figured in the Moorish wars. Pop., 1900, 8410; 1910, 9184.

ALHAM'BRA (Ar. *al*, the + *hamrā*, red). The fortified palace-citadel of the Moorish kings of Granada. As early as the ninth century a citadel was located here with the name *al-Hamra*, which was rebuilt when Granada became the capital of what was left of the Moorish dominions in Spain, by King Mohammed Ibn-el-Ahmar and his successors (1248, 1279, 1306, 1354). The citadel stands on a hill north of Granada, on a terrace about 2500 by 675 feet, and is surrounded by a wall with 13 square towers, over a mile in circuit, built of the red brick which gave it the name of *Kal'at el-Hamrā*, 'The Red Castle.' Inside the citadel were beautiful gardens, a donjon citadel, a gate of justice, a watch tower, and, finally, the palace itself, as sombre and plain on the outside as it was smiling and decorative within. Charles V destroyed a large part of it (especially the Winter Palace) to make room for a tasteless Renaissance building (which, however, was never completed); and Philip V still further mutilated it. Mutilated as it is, it remains the best exemplar of Moorish art in Spain, even though in details the work may not be so exquisite as earlier work in Egypt and the East. What remains is grouped around two principal oblong courts, the Alberca Court, or Court of the Blessing (140 × 74 feet), and the Court of the Lions (116 × 66 feet); and several smaller courts, among them that of the Mosque. There are porticoes, pillared halls, small gardens, baths, and a mosque. The Court of the Lions is surrounded by arcades supported by 124 white marble columns, while similar arcades frame the ends of the other court. The main reception-hall, called the Hall of the Ambassadors, is a square (37 feet), surmounted by a beautiful dome 75 feet high, with stalactite pendentives. Connected with the Court of the Lions are two smaller but equally exquisite halls, the Hall of the Abencerrages, with a dome and exquisite columns, used as a banquet-hall, and the Hall of the Two Sisters, a pleasure-room communicating with the baths. There is a network of smaller apartments. All the surfaces are decorated with a bewildering mass of color and design in tiles, stucco, and painting. The ornamentation comprises intricate geometrical patterns, floral designs and arabesques, and a profusion of Cufic mottoes and of heraldic devices, all stamped or cast in stucco and richly painted in red, blue, black and gold, or executed in a mosaic of small enameled tiles. The most characteristic parts were reproduced in the Alhambra Court of the Crystal Palace, at Syden-

ham, London, and the palace has served as a model for innumerable modern imitations of Moorish art. The Alhambra was partly restored by Queen Isabella II, but was damaged by fire in 1890. Consult: Washington Irving, *The Alhambra* (New York, 1832); Goury and Jones, *Plans, Elevations, Sections and Details of The Alhambra* (London, 1842); M. Junghändel, *Die Baukunst Spaniens* (Dresden, 1889); Girault de Prangey, *Monuments arabes et moresques d'Espagne* (Paris, 1839); Bisson, *Choix d'ornements moresques de l'Alhambra* (Paris, 1855); Contreras, *La Alhambra, el Alcázar y la gran mezquita* (Madrid, 1885); Borrmann, *Die Alhambra* (Berlin, 1900); Calvert, *The Alhambra* (New York, 1907); id., *Granada and the Alhambra* (New York, 1907). See MOHAMMEDAN ART.

ALHAMBRA. A city in Los Angeles Co., Cal., 8 miles east of Los Angeles, on the Southern Pacific and Santa Fe and the Pacific Electric Interurban railroads (Map: California, G 8). It is the seat of the Agnes Hill-Runkle School of Music and the San Gabriel Mission Church (Catholic), founded in 1771 by Franciscan Fathers. There is also a parochial school in connection with the mission. A Mission play similar to the Passion Play at Oberammergau is produced there. The city is primarily residential, but there are some factories. Pop., 1900, 808; 1910, 5021; 1913 (est.), 8000.

ALHAMBRA, THE. A famous collection of tales and legends of the Alhambra, or palace of the ancient Moorish kingdom, at Granada, by Washington Irving (1812).

ALHAZEN, ăl-hă'zen, EL-HASAN IBN EL-HASAN IBN EL-HAITAM, ABU 'ALI (c.965-c.1039). An Arabian mathematician and physicist. From his native city, Basra, he went to Egypt and died in Cairo. A man of remarkable intelligence and productiveness, he wrote commentaries on Aristotle, Galen, Ptolemy, Euclid, and Archimedes, and also made numerous original contributions to science. His *Optics*, the most important Arabic work on the subject, was translated into Latin, probably by Gerard of Cremona, and not by Vitellius, who wrote an original work on optics, and was published at Basel in 1572 under the title, *Opticæ Thesaurus Alhazeni Arabis Libri Septem, nunc primum editi, eiusdem Liber de Crepusculis et Nubium Ascensionibus, etc., a Fcd. Risnero*. Various other of his works have been translated in whole or in part by Woepecke, Sédillot, Suter, and Baermann. He is now known chiefly from the problem bearing his name: From two given points within a circle to draw to a point on the circumference two lines which shall make equal angles with the tangent at that point. For bibliography of this problem, consult the *American Journal of Mathematics*, vol. iv, p. 327.

AL-HEN'NA. See HENNA.

ALHONDIGA DE GRANADITAS, ăl-ôn'dê-gă dă gră'nă-dê'tăs. A fortified public storehouse near Guanajuato, Mexico, where, in 1810, in the beginning of the revolution against Spain, the local government officials took refuge and defended themselves vigorously, being captured only after severe fighting by the insurgents under Hidalgo. Local tradition of the fight declares that when the Spaniards in the granary had exhausted their stock of cannon balls, they used bags of silver coins, fresh from the mint, and also quicksilver flasks, which were stored there for use in connection with the great silver mines of the place. Hidalgo was subsequently

defeated and executed at Chihuahua, and his head was suspended from a spike on the wall of the Alhondiga, now the local prison.

ALI, IBN ABU TALIB, ă'lê ib-nă'bôō tâ'lêb (c. 600-661). Fourth Caliph, cousin of Mohammed, and one of his first converts. Ali became a staunch adherent of Mohammed, and fought bravely and vigorously for him. On the death of Mohammed it was expected that Ali, who had married Fatima, the daughter of the Prophet, would succeed him as leader, but he only reached the caliphate on the murder of Uthman, the third Caliph, in 656. His caliphate was very stormy and full of wars, due to the opposition of Ayeshah, the young widow of Mohammed, and her party, chief among whom stood Muawiya, the Governor of Syria. In the "Battle of the Camel," fought at Basra in 656, Ayeshah was captured, and later Muawiya was met at the battle at Siffin. On the 22d of January, 661, Ali was attacked by three members of the Kharijite sect and murdered at Kufa. Near this city he was buried, and when later a monument was raised to his memory, so many pilgrims came that it became the centre of a city, Masjid Ali. After his death his followers formed themselves into a sect called the Shiite, which numbers about 15,000,000, scattered in Irak, Syria, Afghanistan, India, and in the neighborhood of Medina. Persia is a decidedly Shiite country, while Turkey is Sunnite. The Fatimides, who reigned in Egypt, were believed to be the descendants of Ali and Fatima. Ali was noted for his great knowledge and wisdom. Fleischer published Ali's *Hundert Sprüche* ('Hundred Maxims') in the Arabic and Persian texts, with a translation (Leipzig, 1837). The *Divan* was published by Kuypers (Leyden, 1745), and later at Bulak in 1840. Some of the maxims and poems attributed to Ali, of course, may be genuine, but the majority of them bear traces of later composition. Consult Brockelmann, *Geschichte der arabischen Litteratur*, vol. i, pp. 43-44 (Weimar, 1898).

A'LIAS. A name other than his true and proper name by which a person passes or is known. The phrase (Lat. *alias dictus*, otherwise called) from which the term is derived was formerly employed in indictments and pleadings to render absolutely certain the description of the individual intended by adding his fictitious or assumed name. In order to constitute an alias, the name so described need not be assumed for purposes of deception or from any improper motive. Stage names, pseudonyms, and even nicknames, are properly comprehended under the term. But a name which has, by legal process, been assumed in lieu of one's original name is not an alias. See NAME.

ALI BABA, ă'lê bă'bă. The hero of the story of "Ali Baba and the Forty Thieves," in the *Arabian Nights' Entertainments*. He is a poor forester, who accidentally learns the magic formula which opens the door to a robbers' cave. In their absence he repeats the "open sesame" (which has thus become proverbial), enters the cavern, and loads his ass with their treasures. His brother, Kasim, tries to imitate his success in carrying off their wealth, but after entering the cave, forgets the word "sesame," and so is entrapped and slain by the robbers. These then come to Ali Baba's house concealed in oil jars. They are discovered, however, by the ingenious slave girl, Morgiana, who kills them with boiling oil.



ALHAMBRA
THE COURT OF LIONS

ALIBERT, à'lê'bâr', JEAN LOUIS (1766-1837). Physician to Louis XVIII, of France. As chief physician of the hospital of St. Louis he devoted himself especially to the study of diseases of the skin. His chief work was *Traité complet des maladies de la peau* (1833), but his *Physiologie des passions; ou nouvelle doctrine des sentimens moraux* was given a second edition in Brussels (1825).

ALI-BEY, ä'lê-bâ' (1728-73). Mameluke ruler of Egypt. He was born in Abkhasia in the Caucasus, and when a boy was sold as a slave into Egypt. He gained the favor of his master, and rose to be one of the Mameluke beys. In 1766 he seized the government, freed himself from the power of the Sultan, coined money, and assumed the rank of Sultan of Egypt. Soon afterward he captured and plundered Mecca and undertook to conquer all Syria, in alliance with Daher, Pasha of Acre. At Damascus, June 6, 1771, he routed the Turks with great slaughter and took possession of the city through his general, Mohammed; but the latter turned against him and, proceeding to Egypt, put an end to Ali-Bey's power at Cairo. Returning with an army from Syria, Ali-Bey was defeated at the battle of Salahieh and perished a few days later.

AL'IBI (Lat. elsewhere). A defense resorted to in criminal prosecutions, when the party accused, in order to prove that he could not have committed the crime with which he is charged, tenders evidence to the effect that he was in a different place at the time the offense was committed. When true, there can be no better proof of innocence; but, as offering the readiest and most obvious opportunity for false evidence, it is always regarded with suspicion. Consult Wharton, *Criminal Law* (Philadelphia, 1896).

ALICANTE, ä'lê-kän'tâ. The chief town of a province of the same name in Spain (Map: Spain, E 3). It is picturesquely situated on a steep hill, at the bottom of which it extends along a level strip of land. This latter portion of the city is comparatively modern, well built, and convenient, with fine squares and promenades. The upper city is a jumble of narrow crowded streets. It possesses several fine churches, two nunneries, a library, a bishop's palace, and a picture gallery, and is overlooked by the castle of Santa Barbara from an eminence 850 feet above the sea. The town, which is, with the exception of Cadiz and Barcelona, the most important seaport of Spain, is strongly fortified, and its harbor is naturally protected. Alicante derives considerable revenue as a seaside resort; but its main source of wealth is the export trade, for much of the oil, wine, silk, fruit, saffron, raisins, liquorice, esparto, and grain of the fertile province of Valencia pass through this port. There is a very large tobacco factory. Alicante is the seat of a United States consulate. This town is the Roman Lucentium, and in ancient times was of considerable importance. It was captured by the Moors in 713 and recaptured by Ferdinand III. Pop., 1910, 51,665.

ALICATA, ä'lê-kä'tâ. See LICATA.

AL'ICE. 1. In Shakespeare's *Henry V*, one of the Princess Katherine's ladies in waiting. 2. The heroine of an Elizabethan tragedy, *Arden of Feversham* (q.v.). 3. In Meyerbeer's opera *Robert le Diable*, the foster sister of Robert, who saves his soul from ruin.

ALICE MAUD MA'RY, PRINCESS, GRAND

DUCHESS OF HESSE-DARMSTADT (1843-78). The second daughter of Queen Victoria, born April 25, 1843. She was much beloved by the English people for her amiability, gracious disposition, and domestic virtues. On July 1, 1862, she married Prince Frederic William Louis of Hesse-Darmstadt. She died at Darmstadt, Dec. 14, 1878, of diphtheria, a few days after the death of her youngest daughter from the same disease. Consult Sell, *Letters with Memoirs of Alice, Grand Duchess of Hesse* (London, 1884), and Helena (Princess Christian), *Letters with Memoirs of Alice, Grand Duchess of Hesse* (London, 1897).

ALICE, OR THE MYST'RIES. A novel by Bulwer, published in 1838.

ALICE'S ADVEN'TURES IN WON'DER-LAND. A story for children, by Lewis Carroll (C. L. Dodgson), published in 1869. It is the narrative of a little girl's dream. A sequel to it is *Through the Looking-Glass* (1871).

ALICIA, à-lîsh'î-â. 1. In Rowe's tragedy *Jane Shore* (q.v.), a mischief-making lady who ruins the heroine, through jealousy, and goes mad herself. 2. In Lillo's *Arden of Feversham*, the same character as Alice Arden, in the original Elizabethan tragedy of the same name.

AL'IDADE (Ar. *al-'idâdah*, the revolving arm). A radius bearing a vernier (q.v.), which travels around a graduated circumference. When an angle is to be measured, the alidade takes first the position of one arm of the angle and then of the other, and the arcs are "read" by the vernier; the difference of the two readings is the measure of the angle. See COMPASS.

ALIEN, âl'yen (Lat. *alienus*, strange, foreign). One recognized by the state in which he sojourns as owing primary allegiance to a foreign sovereign. It is used ordinarily in contradistinction to citizen (q.v.). An alien may become a citizen by *naturalization* (q.v.). Alien friend and alien enemy denote, respectively, an alien whose country is at peace, or is at war, with the country where he is sojourning. In Great Britain the status of aliens is regulated by the Naturalization Act of 1870 (33 and 34 Vict. c. 14). In this country their status is determined generally by State laws, although these are subject to some modification by treaties between the Federal government and that of a foreign country. An alien does not possess political rights, nor is he subject to the political duties of a citizen, and yet he may be required to serve in the militia or police of the country where he is residing and to contribute to the support of such establishments. At common law an alien could not become an owner of real property, although a distinction was made between a case of title by *purchase* (q.v.) and by *descent* (q.v.). If an alien acquired title by purchase, as by a grant (q.v.), or devise (q.v.), he was allowed to hold it until office found (q.v.), that is, until his alienage was duly established, upon inquiry instituted by the proper official, while apparent title by descent was absolutely invalid. This common law disability has been removed in England, as well as in many of our States; and aliens may now acquire, convey, and transmit title to real and personal property in the same manner as citizens. An alien friend may contract, sue, and be sued as though he were a citizen while he is allowed to remain in the country; but he may be expelled or deported at any time, subject to treaty stipulations; his immigration may be prevented, or may be per-

mitted, subject to imposed conditions. An alien enemy is not allowed to maintain an action in the courts of this country, unless he can show some special authority or license therefor; but he may be sued here. Nor can he enter into valid contracts with citizens which are inconsistent with a state of war. The tendency of modern law is to accord to alien enemies, who are permitted to remain in a country, all the rights and privileges of alien friends.

The status of aliens in the United States is involved in some ambiguity owing to the diversity and occasional conflict of State and Federal laws with respect to them. Thus a State may violate or may tolerate the violation by its citizens of rights conferred on aliens within its boundaries by treaties made by the Federal government with the foreign government to which such aliens owe allegiance and to which they look for protection. By the Constitution all treaties with foreign powers are a part of the supreme law of the land. In theory, therefore, the treaty rights of aliens are safeguarded by the Federal authority. As a matter of fact, however, the Federal government exercises no effective authority in such cases, and some eminent lawyers deny that it has, under the Constitution, any such authority. The better opinion, however, is that the government has all requisite power to enforce its treaty obligations, and that all that is necessary is for Congress by suitable legislation to put this power into effective judicial form. Consult *Ann. Report, Am. Institute of Criminal Law and Criminology* (September, 1913); C. H. Burr, *The Treaty-Making Power of the United States* (Philadelphia, 1912). Consult Nelson, *Select Cases, Statutes, and Orders Illustrative of the Principles of Private International Law* (London, 1889), and Cockburn, *Nationality* (London, 1869).

ALIEN AND SEDI'TION ACTS. A series of statutes enacted during the administration of John Adams (q.v.), occasioned largely by the desire of the party in power to stifle the more virulent forms of political opposition then prevalent and to check the activities of those who sympathized with France. There were four statutes passed in execution of the policy of the Federalists (q.v.), of which two became especially notorious. The Alien Act, passed June 25, 1798, to remain in force two years, gave the President power to order the removal from the country of aliens judged to be dangerous, and provided that if those so notified did not leave the country or secure from the President a license to remain, they would be subject to imprisonment for not over three years, and be disqualified from ever becoming citizens of the United States. The President also might order the removal from the country of any alien thus imprisoned, and if such alien should thereafter be found in the country he might be imprisoned for as long a period as the President should deem the public safety required. The Sedition Act, passed July 14, 1798, to be in force until March 3, 1801, imposed penalties not exceeding a fine of \$5000 and five years' imprisonment for conspiring against the government and its measures and for interfering with the operations of the government. It imposed a penalty of imprisonment for not over two years and a fine of not over \$2000 for printing scandalous material concerning the Federal government, the President or Congress. There were also passed the

Alien Enemies Act, July 6, 1798, providing for the treatment of aliens with whose government the United States might be at war, and the Naturalization Act, June 18, 1798, fixing 14 years' residence as a qualification for the acquisition by foreigners of citizenship. The extreme character of these statutes and the partisan spirit which produced them caused an immediate and violent reaction, which was expressed in such forms as in the Virginia and Kentucky Resolutions (q.v.) and which hastened the overthrow of the Federalist party. See historical section under UNITED STATES. For the method and consequences of the enforcement of the above acts, consult Wharton, *State Trials of the United States during the Administrations of Washington and Adams* (Philadelphia, 1849).

ALIENATION, ā'lyen-a'shūn (Lat. *alienatio*, the transferring of the possession of a thing to another, from *alienus*, another's, foreign). A legal term to describe the transfer of title to land, or of any interest therein. The modes in which alienation is effected are numerous, ranging in our legal system from the feoffment (q.v.), or livery of seisin (q.v.), of old English law, to the modern transfer by deed (q.v.) or will (q.v.). (See CONVEYANCE.) The right of alienation is one of the two great incidents of the ownership of property, as now understood (the other being the right of inheritance); but this is a distinctly modern notion, and ownership may well exist, and has often existed, without the right to alienate the property owned. In English law the right of a freehold tenant to alienate his lands was long restricted by rules derived from the feudal system. Most of these restrictions were swept away by the third statute of Westminster (18 Edw. I, 1290), known as the Statute Quia Emptores (q.v.), which declared that from thenceforth "it should be lawful to every freeman to sell at his own pleasure his lands and tenements, or part of them," and the few that remained, by the statute of Military Tenures, passed in 1660 (12 Car. II, c. 24), which deprived the crown of the right to exact of its tenants *in capite* the obnoxious fines on alienation. But it was not until the thirty-second year of Henry VIII (1527), that the right to alienate lands by will was finally conceded by Parliament. Now, however, the principle of the alienability of real property has become so firmly established that we cannot conceive of absolute ownership without that quality, and it has long been a rule of our law that a condition attached to the grant of a fee, forbidding or restraining its alienation, is void, as being repugnant to the estate granted. It should be said, however, that such conditions annexed to life estates and leaseholds are perfectly good and of frequent occurrence.

Alienation may be either voluntary or involuntary. The former comprehends the usual modes of conveyance, including transfers by will. The latter refers to the acquisition of title by judgment, execution, bankruptcy, and the other modes in which creditors have at different times and in different jurisdictions been permitted to satisfy their claims by legal process out of the real property of the debtor. See the authorities referred to under the title REAL PROPERTY.

ALIENATION OF AFFECTION. See HUSBAND AND WIFE.

ALIENIST, ā'lyen-īst. See PSYCHIATRY.

ALI FERROUGH BEY, ā'lê fēr'rô bâ (1865—). A Turkish statesman who was born

at Constantinople, and became successively secretary of the embassies at Paris, London, and Bucharest; councilor of the embassy at St. Petersburg and Minister Plenipotentiary and Envoy Extraordinary of Turkey to the United States. He published *Public and Private International Law*, and histories of Arabia and Turkey. He was recalled from his post at Washington in 1901.

ALIGARH, ä'lê-gär'. The capital of the district of the same name (area, 1958 square miles), in the Northwest Provinces of India, the native name of which, Koil, has been replaced by that of the adjoining fort, famous for its commanding situation and historic associations. The fort, at an altitude of 740 feet, stands in lat. 27° 56' N., long. 78° 8' E., 47 miles north of Agra and 74 miles south of Delhi (Map: India, C 3). Its capture from the Maharrattas in 1803 by General Lake assured British supremacy in the Upper Doab, and it was the scene of exciting incidents during the mutiny of 1857. Cotton and grain are the principal products of the district, and the only important industries are the manufacture of flour and cotton pressing. The town on the railway route from Calcutta to Peshawar is a thriving municipality. It is the seat of the Mohammedan Anglo-Oriental College, which is connected with the University of Allahabad. Pop. of town, 1891, 61,485; 1901, 70,434; 1911, 64,825.

ALIGNMENT. A term used in surveying, drawing, and military tactics, equivalent to "in line." Thus, the alignment of a battalion is effected when the men are drawn up in line; the alignment of a camp is a rectilinear arrangement of the tents, according to some prearranged plan.

ALIKHANOFF, ä'lî-kä'nôf, GENERAL (Ali Khan Avarski) (1846-1907). A Russian soldier. He was born at Baku, of Lesghian parentage, and was educated at Webb's School at Tiflis. In 1862 he entered the Russian army as cornet and saw service in the Caucasus. His efficiency soon won for him promotion to the rank of major, and the position of aid-de-camp to the Grand Duke Michael, then Viceroy of the Caucasus. In 1877, as the result of a quarrel with a superior officer, he was reduced to the ranks: as a private soldier taking part in the disastrous campaign against the Turcomans in 1879, and serving also under Skoboleff. He attracted attention by writing for the *Moscow Gazette* a series of brilliant articles describing the Russian advance on India. Of such value did his services become that he was made lieutenant in 1882. Soon afterward, when he had been secretly to Merv, and had negotiated successfully with the Turcoman chiefs to secure their submission, he was made lieutenant-colonel and first Governor of the territory thus gained. He took a conspicuous part in the "Penj-deh affair" of March 30, 1885, when the Russian troops, under General Komaroff, attacked and defeated the Afghan forces while the Russian and British governments were negotiating the boundary of Afghanistan. In 1901 he was promoted to be major-general. The severity with which he treated the Armenians and Georgians over whom he was placed gained for him the bitter hatred of these peoples. He was sent to investigate the Tatar-Armenian outbreak of 1905, but his sympathy with the Mussulman was so obvious that he was soon recalled. In the same and following years he suppressed with great severity the

disturbances in Georgia. He was killed by the explosion of a bomb at Alexandropol, in the Caucasus, on July 16, 1907. The assassination was attributed to an Armenian effort for revenge.

ALIKULUF, ä'lê-kôo-lôof'. A tribe occupying the central and western region of the archipelago of Tierra del Fuego, South America, and representing a distinct linguistic stock, the Alikulufan. Although they go almost naked in the coldest weather, and huddle in shelters hardly deserving the name, they show great skill in the making of weapons, fishing utensils, and canoes, while the women weave water-tight baskets of reeds. They have also trained a native dog to hunting. They now number but a few hundred at most. Consult Chamberlain in *American Anthropologist*, N. S., vol. xiii, pp. 89-92 (1911).

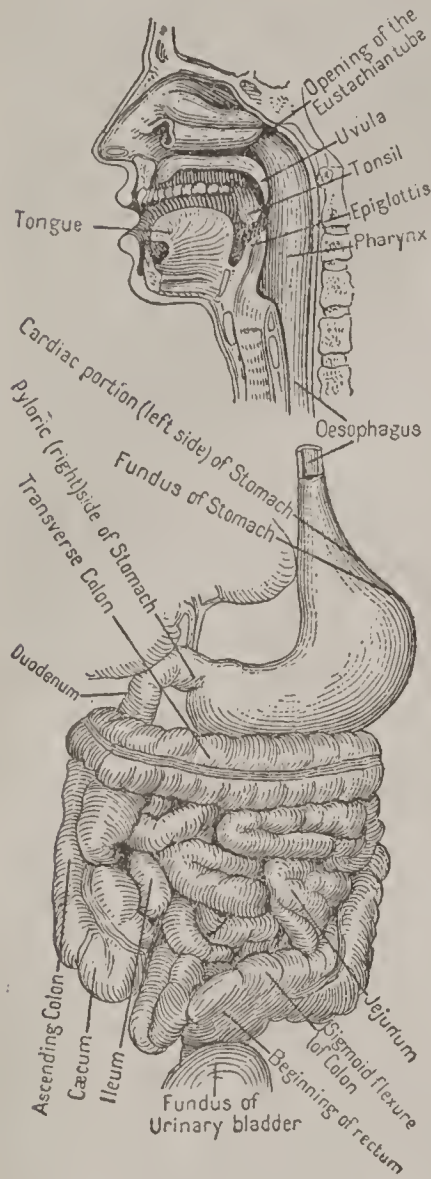
ALIMA, à-lê'mâ. A tributary of the Lower Congo, rising in French Congo, and after a short course westward emptying at Ibaka (Map: Congo Free State, C 3). In its lower course it is navigable for light vessels. It was discovered by De Brazza in 1878 and thoroughly explored by Balley in 1883.

ALIMENTARY CANAL (from Lat. *alimentum*, food). In mammalia, that portion of the digestive apparatus through which the food passes from the time of its entrance until its exit from the body. It is lined by a mucous membrane, which extends from the lips to the anus, being modified in each region. (See MUCOUS MEMBRANE.) The alimentary canal begins at the mouth and is continued into the space called the pharynx, which also communicates with the nostrils above, and the gullet or œsophagus below. The pharynx is surrounded by three muscles, the constrictors, which grasp the food and force it into the next portion of the alimentary canal, the œsophagus. This is a tube composed of an outer layer of longitudinal muscular fibres, and an inner of circular, which extend down to and spread out upon the stomach. These fibres, by a series of peristaltic contractions, carry the morsel of food along into the stomach. In vomiting, there is a reversal of these actions, which ruminating animals can accomplish at will. The œsophagus passes through an opening in the diaphragm and joins the stomach, which is a pouch curved with the concavity upward, expanded into a *cul de sac* on the left side (the cardiac extremity), and gradually narrowed to the right or pyloric end. It consists of muscular fibres continuous with those of the œsophagus, which become thicker toward the pylorus. Its external surfaces are covered by peritoneum, and its thick, soft mucous lining, when the stomach is empty, lies in folds. Between the muscular and mucous layers is a fibrous layer, in which the blood vessels lie before they pass into the mucous layer. (See STOMACH.) At its pyloric or right extremity the stomach communicates with the small intestine, which is about 22 feet in length and is arranged in convolutions, which occupy the middle portion of the abdominal cavity, being kept in position by the mesentery, which attaches them to the posterior wall of the abdomen.

The small intestine is subdivided into three parts. The first 10 inches from the stomach constitute the *duodenum*. Into it open the duct of the pancreas and the common bile duct. Of the remaining portion, the *jejunum* includes about two-fifths and *ileum* three-fifths. The tube con-

sists of three layers, and the whole is surrounded by peritoneum. See **INTESTINE**.

The ileum ends, in the right iliac region, in the large intestine, which is from 5 to 6 feet



ALIMENTARY TRACT IN MAN.

in length. It begins at the pouch called the *cæcum* (q.v.), from which springs the *appendix vermiformis*; a double valve guards the opening of the small into the large intestine. The colon passes upward on the right side nearly to the liver (ascending colon), crosses the left hypochondrium (transverse colon), descends to the left iliac fossa (descending colon), where it bends like an S (sigmoid flexure) and joins the rectum at the left margin of the true pelvis. The colon is distinguished by its pouched or sacculated appearance and the presence of three flat bands of longitudinal muscular fibres on its exterior wall.

The peritoneum covers it only in parts. (See **COLON**.) The rectum is not sacculated, but its muscular coat becomes much thicker; at its lower end the longitudinal muscular fibres stop, but the circular fibres become greatly increased, forming the internal sphincter muscle. See **ANUS**.

The alimentary canal thus consists of a continuous passage lined by mucous membrane, which rests on a fibrous and muscular layer. Its length is generally about five or six times the length of the body, or 30 feet. It begins below the base of the skull, passes through the thorax, abdomen, and pelvis, and consists, in brief, of the mouth, pharynx, oesophagus, stomach, small and large intestine. The above description refers to the alimentary canal in human anatomy; its parts are variously modified in different animals, as will be found in the articles on its several subdivisions. The process of carrying the digested food to the tissues of the body is discussed under **CIRCULATION**.

ALIMENTARY SYSTEM, EVOLUTION OF THE. An alimentary system as defined above is almost wanting among plants, which, practically without exception, use only fluid or gaseous food, or else render solid substances fluid before ingestion. This difference between animals and plants is one of the best distinguishing characters.

Types of Alimentary Tracts. The simplest may be designated the temporary type—that exhibited by *Amœba*. This jelly-like, amorphous organism, when it comes upon a solid particle in the water, simply engulfs it at any point by flowing around it. The engulfed particle is sur-

rounded by a sphere of water. From the plasma of the *Amœba* an acid is secreted into the sphere of water, and this dilute acid gradually dissolves the solid particle; the solution is then absorbed by the protoplasm. In the case of the *Amœba* there is no definite, permanent alimentary tract. The same is true of all the rhizopodous Protozoa and of the parasitic ones which do not feed on solids. Many of the ciliate and flagellate Infusoria, on the other hand, ingest solid particles through a permanent mouth and gullet into the general protoplasmic spaces. The surface around the mouth opening may be provided with cilia to carry food into the mouth.

The second type of alimentary tract is permanent but diffuse. This is the type exhibited by sponges. There is not one digestive region, but hundreds of them, as many, indeed, as there are pores and canals passing through the body wall. The solid food passes into these canals; the canals are lined by curiously modified "collared" cells. These pick up the particles and engulf them, as a flagellate infusorian does. The whole sponge, indeed, behaves like a colony of Protozoa, specialized in different directions in different regions of the sponge body.

The third type of alimentary tract is permanent, and concentrated in one cavity, and that cavity is a sac, having only one external opening. This type is characteristic of all the Cnidaria, and is found in certain flatworms. It is typically illustrated by *Hydra*. *Hydra* consists of a body wall surrounding a central cavity that has one opening at the upper pole, surrounded by a circlet of tentacles. The opening serves both as mouth and anus. The body wall is two-layered; the outer layer is the sensory one; the inner layer is digestive. The origin of this type is uncertain; it seems quite likely that it has not developed from the sponge type, but that it represents an altogether new line of evolution, in which the body is not to be considered as a colony of infusoria-like cells, but as a greatly enlarged protozoan, with many nuclei and hence with many cells. On this last hypothesis the digestion cavity of *Hydra* would be homologous with that of an infusorian. In the sea anemones the digestive sac is more complicated than in Hydrozoa, in that it is divided into a number of alcoves opening into one central chamber. The alcoves arise in consequence of a series of radial partitions (called mesenteries) arranged in a plan of four and its multiples or six and its multiples, that pass from the outer body wall toward the centre. In the sea anemones the entrance to the digestive sac is an elongated slit that serves both as mouth and anus. According to one theory, the separate mouth and anus of higher forms arise from opposite extremities of this slit, while in the middle part of the slit the lips are fused together. In the lower flatworms, the planarians and trematodes, the body is elongated, and the digestive sac is elongated likewise; but it is still a sac with a single opening. The cestodes, being abject parasites living in the digestive juices of the host, need no digestive tract and have none. In the higher flatworms, nemathelminths, Nemertinea, Bryozoa, and Brachiopoda, as well as in mollusks, mouth and anus have become distinct, and the digestive sac has become a digestive tube or canal, as in higher groups. With the formation of a digestive tube three portions may be distinguished; viz., fore gut, mid gut, and hind gut. The first and last

are usually of ectodermal origin. The mid gut is usually lined by entoderm. These three parts of the alimentary tract undergo special modifications. The beginning of the fore gut, or mouth, becomes fitted with grasping and sensory organs; and lower down in the œsophagus there is frequently found a crushing organ, the gizzard. The mid gut is very glandular. In many species the glands have enlarged to perform their work better, and appear as appendages of the mid gut; e.g., the pancreas or hepatopancreas. The hind gut is the rectum. These conditions are shown in their simplest form in the annelids. The sandworm of the sea coast has great jaws in the œsophagus, which is protrusible. Behind, a pair of digestive glands open into the food canal. In the earthworm the œsophagus leads into a crop, and this in turn into a muscular gizzard. In the intestine two dorsal grooves add to the glandular surface. Passing to arthropods, we find the mid gut occasionally coiled, and frequently bearing digestive glands, that gain a great size in the Decapoda. A gastric mill is present in the Malacostraca. In both annelids and arthropods the mouth is on the same side of the body as the great nerve cord, and the anus is placed in the last metamere of the body.

In the Chordata the alimentary tract has very different relations from those found in the Annelida and Arthropoda. In the latter groups the alimentary tract lies dorsal to the main nerve and ventral to the heart; in the chordates the tract is dorsal to the heart and ventral to the spinal cord. The question how the vertebrate condition is derived from the invertebrate condition is a difficult one to answer. It has even led some to deny that vertebrates are related to Annelida or Arthropoda, as it is impossible to think of an animal adapted to traveling on one surface turning over and traveling on its back and transmitting this tendency to its descendants. It is more likely that the intermediate form was one that, like many of the lowest Chordata—the tunicates—was sessile in a ventral position at some time of life and consequently had neither dorsal nor ventral surface.

Embryological History. The history of the alimentary tract in vertebrates is as follows: Part of the outer layer of the germ becomes infolded as a pocket to form the lining of the archenteron or primitive gut. (See EMBRYOLOGY.) By the continued growth of the mesoderm and body cavity the archenteron comes to lie as a canal, closed at the anterior end and communicating posteriorly through the "neurenteric canal" with the neural tube. Later, an infolding of ectoderm occurs on the ventral surface of the embryo to form the proctodeum and anus. The neurenteric canal closes and the post-anal gut degenerates. Finally the ectoderm is in-pocketed at the anterior end of the archenteron, forming the stomodeum, and the two cavities become confluent by the breaking away of the opposed walls. Thus, the completed alimentary tract is composed of an ectodermal anterior and posterior end and of an entodermal middle portion. It is enveloped by a mesodermal layer.

Phylogenetically, two quite distinct parts in the alimentary tract of vertebrates can be distinguished, and these do not coincide with the embryological divisions. In *Amphioxus* more than the first half of the length of the alimentary tract is devoted to the purpose of respiration, since its walls are provided with gill slits.

This may be called the respiratory part of the alimentary tract in contradistinction to the remaining hinder portion—the digestive part. The first is also known as the proenteron. The hinder part is often divided into two—its entodermal part (mesenteron) and its proctodeal portion (metenteron). It will be convenient to treat of the alimentary tract under the three heads of proenteron, mesenteron, and metenteron. Before going on to this analytical treatment of the tract and its appendages, a few words may be said concerning the general histology of the entire tract. As already stated, two germ-layers are involved: entoderm (or ectoderm) and mesoderm, and to these must be added mesenchyme. The entoderm is always a single layer and forms the so-called *mucosa*; it gives rise to the digestive and glandular epithelium. Next outside lies the mesenchymatous mass, with its blood vessels and nerves—the *sub-mucosa*. Outside of this is the muscular layer derived from mesoderm and containing within circular muscle fibres and without longitudinal ones. Lastly, outside of all and continuous with the lining of the body cavity in all its parts, is the layer of flat epithelial cells, constituting part of the peritoneal membrane.

The Proenteron.—This region is characterized, in the lower forms, by gills. In *Balanoglossus* and in *Tunicata* such a gill-bearing region is well developed, and in the *Tunicata* becomes extremely complex, in adaptation to their sessile habit, which requires large respiratory surface, since a change of water cannot be got by traveling. In *Amphioxus* the gill slits are simple but very numerous—100 or more. The variability in number arises from the fact that the slits continue to increase in number as the animal grows older, new ones being formed at the posterior end of the series. Thus the proenteron grows at the expense of the mesenteron. In embryologic history a single row of 14 slits first arises as ventro-dextral organs; next, a second row of 9 slits is formed at the right of the first, which, as it grows larger, pushes the first row to the left side, where it lies permanently. The cause of the development of the left series on the right side is that the large mouth at first occupies the left side, and its movement ventrally is accompanied by profound changes in the surrounding parts. It has been suggested that the mouth of the ancestors of vertebrates was placed in the mid-dorsal line in front of the notochord; but that, the support of the notochord being needed for the snout in the animal's journeys through the sand, it pushed forward and thrust the mouth to one side. The mouth is dorsal, or, better, *neural*, in young tunicates and in adult annelids; and the embryonic changes in the position of the mouth in *Amphioxus* apparently recapitulate the phylogenetic changes. The gill slits of the young *Amphioxus* open from the gut cavity directly to the exterior, but later they open into a common atrium on the ventral side, which functions somewhat as an operculum. The details of the gill system of higher vertebrates will be discussed under RESPIRATORY SYSTEM. It is here merely necessary to say that the number of gill slits becomes much reduced, usually to five or six pairs of slits.

The Mouth.—The beginning of the alimentary tract is enlarged to form an oral or buccal cavity, provided with teeth and glands. The glands are modified skin glands, as would be

expected from their ectodermal origin. The glands develop by a depression of the epidermis and come to lie imbedded deeply in the cutis of mesenchymatous origin. The function of the glands is to keep the mouth moist, consequently they are found only in land vertebrates. The poison glands of serpents are modified oral glands. Salivary glands find their highest development in mammals. They are probably immensely developed skin glands or groups of such. They secrete a thick, glairy fluid, whose chief function is to moisten the food and thus to assist in its mastication and deglutition. On this account these glands are most highly developed in the Herbivora and are absent in Cetacea. Saliva also acts upon starchy food, converting it into sugar.

The tongue is a mass of intertwined muscles, having various functions, as of tasting, grasping, touching, and speaking. In fishes it is little developed, being represented by a thickening of the mucosa covering the ventral part of the hyoid bone. In Amphibia and reptiles it shows a great advance in size and complexity, being capable of extrusion to a great extent (especially in lizards), both through the elongating action of its intrinsic muscles and the forward movement of the base of the hyoid bone.

The thymus gland arises in fishes by the budding off of epithelial masses from the anterior four or five gill pockets; it is thus of multiplex origin. Usually these independently arising masses fuse into a pair of spindle-shaped bodies, but in the Gymnophiona the components persist as distinct bodies. In the land vertebrates, with fewer gill-slits, the points of origin are reduced in number. Into the paired masses connective tissue and blood vessels grow, eventually constituting the greater part of the organs. The function of the thymus is still unknown. It attains its largest size in reptiles and birds. In man it reaches its maximum development in the second year and then gradually degenerates.

The thyroid gland arises directly from the alimentary tract. It has a double origin. First, it arises as an unpaired pocket of the ventral wall of the pharynx behind the last gill-slit: the paired masses are called "accessory thyroid glands." The median part is morphologically the most important. It is the only part found in Amphioxus and Cyclostomi. In these groups it exists as a groove in the ventral wall of the pharynx, called the "hypobranchial groove." A similar groove is found in all tunicates (the "endostyle"), and is glandular in function. In the lower true vertebrates, where the paired components first arise, they remain distinct; in mammals all components fuse.

Œsophagus and Stomach. These parts of the alimentary tract constitute the fore gut in the more restricted sense. They are limited anteriorly by the oral cavity; the limitation is a sharp one, however, only in mammals, which possess a soft palate that curtains off the mouth from the respiratory passage. This soft palate makes its first appearance in the crocodiles, but without the uvula. The posterior limit of the fore gut is not always easy to fix, since not all vertebrates have a specialized stomach with a pyloric valve. The opening of the bile duct may be taken as the lower limit. The post-pharyngeal proesenteron is extremely short in Amphioxus and the lowest vertebrates, and is of relatively slight importance; it gains size and importance as we ascend the vertebrate series. The

digestive function is, in the higher groups, transferred to a more anterior region of the enteron, and, coincidentally, the entire alimentary tract, which is primitively straight, undergoes a great increase in length and becomes strongly folded. A differentiation of the proesenteron into œsophagus and stomach is first indicated in selachians, and becomes pronounced in Amphibia. The two organs differ not only in their diameter, but also in the character of the mucous membrane, which is smooth and forms a ciliated epithelium on the œsophagus and folded and non-ciliated in the stomach. In birds the œsophagus is specialized, in that it is greatly enlarged at one point, forming the crop. The crop is best developed in granivorous birds; in it grain is acted upon chemically. Certain fish-eating birds have a reservoir (false crop) for excess of food. Insectivorous and frugivorous birds have no sign of a crop. The stomach, likewise, is very complex in birds. There is first a highly glandular, chemically active *proventriculus*, and, below, a mechanically acting muscular stomach or gizzard. In mammals the stomach is the most distended and one of the most functional parts of the alimentary system. An anterior or cardiac portion can be distinguished from a posterior pyloric part. The stomach is larger and more complex in herbivores than in carnivores. In the herbivores the cardiac and pyloric parts are each divided into two parts. The first is a large sac called the pouch, or *rumen*. It communicates broadly with the second chamber, the *reticulum*, so called from its network of folds. Next comes the *psalterium*, whose walls are raised into high, thick-set folds, so that under most circumstances nothing but semi-fluid materials can pass between the folds. The last part is the *abomasum*, with highly vascular and glandular walls. This complex stomach seems to have arisen by natural selection as an adaptation to the peculiar habits possessed by the ruminants. They are all weak, defenseless mammals, and their herbivorous habits require that they shall feed in open fields where the danger of detection by the larger carnivores is very great. The shorter the time they are exposed in the open field the less will be the chance of their destruction. It has therefore been of advantage that they have become able to crop a large amount of grass rapidly without masticating it, the mastication being first done after the ruminant has retired from the field to the secluded forest. The food thus taken into the stomach fills the rumen and reticulum and is mingled with and partly macerated by the saliva. By the action of the abdominal muscles and diaphragm, as in hiccoughing, the food is returned to the mouth and is there masticated. Finally, divided and mixed with saliva, it passes down the œsophagus and is led by means of a special fold directly to the psalterium, through the leaves of which the finely triturated mass can pass. In the fourth part, or abomasum, true gastric digestion now occurs.

Intestinal Region. The mesenteron is, in the higher vertebrates, separated from the proesenteron by a circular fold of the intestinal wall, the pyloric valve. The function of the tract is, on the one hand, to secure fluids that will finish the work of digesting the food which was begun in the stomach, and on the other to absorb the products of digestion. The variations in form of the mesenteron are all to enable it to perform the processes to better advantage. Some of the variations are readily visible to the naked eye,

such as the foldings of the gut or out-pocketings from it; others are microscopic, and due to foldings in the lining of the alimentary tract.

Liver and Pancreas. The largest of these out-pocketings is the *liver*. It is phylogenetically an old organ, as it occurs in all the vertebrates, even in *Amphioxus*. The form of the liver is always closely adapted to that of the cavity in which it lies. In myxinoids it consists of two lobes, and this is probably the "ground-form" of the organ in all vertebrates. In many cases it is further subdivided into (dog, weasel) six or seven lobes even. The right lobe is the larger, and in it the gall-bladder, when present, lies imbedded. The liver arises as an evagination of the epithelial lining of the ventral wall of the anterior portion of the intestine. In *Amphioxus* it is located just behind the gill region. The hepatic fundaments are soon transformed into glands made up of branching tubules. The network of tubules early differentiates into excretory and secretory parts. In amphibians and reptiles the tubular nature of the gland is easily recognizable, but in higher vertebrates (birds, mammals, man) the tubular structure is inconspicuous. Simultaneously with the development of the tubules a meshwork of blood vessels appears in the liver. In birds and mammals at the point at which the primary bile ducts open into the duodenum a small evagination is formed. This evagination elongates to form the bile duct. The gall-bladder is a reservoir for storing the gall. It develops as an evagination of the bile duct or from the hepatic ducts. The liver serves as a storehouse in which the sugar not needed by the system for immediate consumption is stored up in the form of glycogen; it destroys the old red blood corpuscles and oxidizes nitrogenous materials into urea. Its function in digestion is less clearly understood. Fats, however, more easily pass through a membrane moistened with bile, and a greater proportion of fat passes unabsorbed through the intestine of a dog when the bile duct is stopped; hence bile probably aids in some way in the absorption of fats. The alkalinity of the bile also aids the pancreatic juice in overcoming the acidity of the gastric juice. Bile also aids in stimulating the action of the muscles of the intestine. Its absence leads to biliousness and even jaundice, and finally the bile acts as a preservative when deficient putrefaction of the contents of the alimentary canal results. The pancreas also arises as an evagination of the alimentary tract, but from the dorsal side of the duodenum, and usually opposite the origin of the liver. Except in cyclostomes and some teleosts, the pancreas is always present in vertebrates. Its size and form varies, and it is not infrequently lobate. In structure it is a racemose gland. Its secretion is either poured directly into the intestine (as in birds, crocodiles, *Emydidae*, and some mammals), or, as development proceeds, its outlets move nearer and nearer the bile duct, and finally the secretions of the liver and pancreas are poured into the intestine through a common duct. The pancreatic secretion is alkaline. Its rôle in digestion is very great. Its action on starch is like that of the saliva, only much more energetic. Through the agency of the ferment trypsin it affects proteids, and by another ferment, steapsin, fats are split up into fatty acids and glycerin. The soap and glycerin are both soluble in water and hence are easily absorbed. Much of the fat, however, is emulsified by the albumen;

that is to say, it is broken up into fine drops, which are prevented from fusing by the presence of a coating of albumen. The fat in the emulsion is probably capable of absorption as it is.

The Pyloric Tract. The straight tube of *Amphioxus* is chiefly an absorbing organ, the digestive secretions being poured into the cavity from the liver. In the earth-inhabiting *Gymnophiona* and *Amphisbænæ* and the elongated snakes the alimentary tract is little convoluted, since here either the process of absorption is not very rapid, or the area of the mid gut is, even when straight, considerable, relative to the total volume of the body (snakes). The mesenteron is also straight in *Petromyzon* and some of the sharks which lead an active carnivorous life, but the shortness is fully compensated for by an extensive folding of the inner absorbing surface through the formation of the so-called spiral fold, or spiral valve. The method of origin of the fold is seen in *Petromyzon*, where it is first represented by a strong, spirally twisted artery lying on the internal wall. This gradually sinks deeper and deeper toward the lumen of the gut, carrying the wall of the gut before it. As a result of this process we find a long, spirally twisted fold projecting far inward from the wall of the gut. The fold itself is richly vascular, from the ramifications of the small blood vessels from the artery. Such a spiral valve is found best developed in *Selachians*, but it exists also in *Ganoids*. *Teleosts* lack such a spiral valve, but the absorbing surface is increased by another means—namely, by out-pocketings, so-called *pyloric appendages*. That these are primarily not glands, but have an absorbing function, is indicated by two facts: (1) They are sometimes found stuffed with food, and (2) their presence seems to be correlated with the absence of the spiral valve and vice versa, even in closely allied species having similar habits; and therefore it is probable that they fulfill the same office in the economy of the organism. Thus, *Polypterus* possesses a well-developed spiral fold, but only a few pyloric appendages, while *Lepidosteus*, which is provided with only a slight fold, is superabundantly provided with pyloric appendages. All of this evidence is not quite satisfactory, and it seems probable that in some cases the pyloric appendages are indeed glandular—as, for instance, when several open into the mesenteron by a common duct. Physiological studies are needed to settle this question.

The Mesenteron.—From the *Amphibia* on, with exceptions, the mesenteron becomes more and more convoluted externally, and at the same time the absorbing surface is increased by folds. Thus, in the frog, the anterior part of the mesenteron is covered by a fine network of folds. Further posteriorly these arrange themselves into structures like the semi-lunar valves of the heart, opening backward. Similar contrivances for increasing the internal absorbing surface are found also in reptiles and birds. In birds and mammals, when the longitudinal folds of the mesenteron are poorly developed, we find finger-like processes—*villi*—produced into the lumen of the gut. Into these folds of the mucous epithelium are continued the connective tissue of the submucosa, together with blood vessels, lymph vessels, and nerves. Food in solution is taken up by the epithelial cells just as an *amœba* takes it up by throwing out pseudopodia. A large share of the absorptive process is probably to be assigned to the lymph cells, which wander

about in the submucosa and even make their way through the mucosa into the lumen of the gut.

Metenteron.—Like the other parts of the alimentary tract, this becomes differentiated from the common enteron only in the higher vertebrates. In the higher fishes it is indicated by an enlargement of the intestine. This enlargement is directly continuous posteriorly with the cloaca, into which also the urogenital ducts open. In Amphibia and reptiles the ventral wall of the hinder part of the metenteron is enlarged to form a (functional) urinary bladder. In Amniota the metenteron is separated from the mesenteron by an ileo-cæcal valve (q.v.). In nearly all vertebrates the metenteron—in contradistinction to mesenteron—has a straight course; hence it is often called *rectum*. In many mammals, as in man, it is greatly elongated, forming a colon ascendens, transversus, and descendens. A blind pocket or *cæcum* is often formed in connection with the metenteron and is a mere swelling in the wall in reptiles, but attains an enormous development in many birds, in which group it is usually paired. In mammals it is never so long as in birds, but is variable in extent. Thus, in herbivores it may even be as long as the body of the animal possessing it, and in some rodents it contains a spiral valve. In carnivores, on the contrary, it is poorly developed. It would seem to be somewhat compensatory with relation to the rest of the metenteron, for it is much better developed in the horse and allies which have a simple stomach than in the ruminants with a complicated one. Among certain mammals (e.g., man) the distal part of the cæcum is greatly reduced, forming the vermiform process. In man the cæcum is at first of nearly uniform character—the vermiform process arises by a degeneration of its distal end—a process which occurs relatively late. This indicates that in man the cæcum was quite recently of relatively greater importance, and indicates further that man's ancestors were herbivorous—a fact which the presence of the now degenerating third (hindermost) molar likewise confirms.

There are certain other appendages of the metenteron to which we can only refer. Such are the unpaired finger-shaped gland of the dorsal roof of the rectum in sharks, the paired dorsal pockets of Chelonia, and the unpaired bursa Fabricii of birds. The function of the last two organs is doubtful. The bursa Fabricii is a spherical or club-shaped organ lying ventrad to the vertebral column and dorso-caudad to the rectum, to which it is attached postero-ventrad to the urogenital opening. It arises as a solid mass, in which secondarily cavities appear, lined by epithelium from the mucosa of the metenteron. They are, therefore, not to be regarded as lymph spaces, nor the organ as a lymph organ. Its development is, therefore, much like that of the thymus gland. The organ degenerates toward the end of the first year, but persists throughout life in some species as an organ covered with a connective tissue coat, and possessing many elongated follicles lined by epithelium within. The function and phylogenetic significance of this organ are both obscure. Possibly it is homologous with the paired pockets of Chelonia; the ontogeny of these latter organs is, however, yet quite unknown.

ALI MIRZA, ä'lê mēr'zâ, MOHAMMED (1872—). Shah of Persia, who succeeded his father, Muzaffar-ed-Din, on the death of the lat-

ter on Jan. 8, 1907. He was educated in Europe and prior to his succession to the throne was Governor-General of Azerbaijan, a position in which heirs to the Persian throne usually receive their preliminary training. His European education, it was thought, had given him pronounced sympathies for western civilization, and hopes were entertained for the prosperity of Persia under his rule. Soon, however, he showed himself arbitrary and untrustworthy, and he became so unpopular that an attempt was made on his life on Feb. 28, 1908. The agitation made by the so-called Nationalist Party for reforms in the government in 1898 (see PERSIA) resulted in the practical defeat of Mohammed and the establishment of a Russian-English protectorate over Persia. Internal dissension continued in 1909, and on July 13 of that year the Nationalists succeeded in obtaining possession of Teheran, the capital. The Shah took refuge in the Russian legation, finding himself, on the formation of a Nationalist Assembly, deposed, and his son, Ahmed Mirza (q.v.), chosen Shah in his place. Forbidden to remain on Persian soil, Mohammed left for Russia, but at once began intrigues to regain his throne. Having succeeded in 1911 in raising and equipping a body of troops, he arrived in Persia in July of that year. At once the Mejliss, or Assembly, placed on his head a price of 100,000 tomans (about \$178,000). His adherents were defeated by the Nationalist forces, and in March, 1912, he was obliged to return to Russia, where he rejoined his family.

AL'IMONY (Lat. *alimonia*, *alimonium*, nourishment, sustenance, from *alere*, to feed, nourish). In English and American law, the allowance which a married woman is entitled to receive out of her husband's estate by decree or order of the court on judicial separation or divorce *a mensa et thoro*. By Scotch legal writers the term is sometimes used as synonymous with aliment. In the United States jurisdiction with regard to alimony is conferred, in general, by statute on courts of equity. Alimony is of two sorts: *pendente lite* and permanent. The object of the first is to enable a wife to carry on litigation with her husband by securing her support during the pendency of suit. Should she have sufficient means of her own, no allowance will usually be made; the amount is fixed at the discretion of the court and may be changed by the same authority. Permanent alimony is a periodical allowance from a husband decreed to a wife as the result of litigation in her favor. If the result be against her, no allowance is made. The amount varies with the means of the husband and the needs and position of the wife, but is usually from a third to one-half of his income, and is subject to change from time to time, as the court finds circumstances to warrant. The court may enforce its decree by contempt proceedings and the commitment of the defaulting husband to jail, and can prevent a husband from leaving the State if it is made to appear that he means thereby to avoid payment. In some States alimony becomes a lien on the husband's real estate, or the court may compel him to give security for its prompt payment; or, in proper cases, the husband may be restrained by injunction from so disposing of his property as to place it beyond the reach of the court. See DIVORCE.

ALIN, ä'lîn, OSCAR JOSEF (1846–1900). A Swedish historian and politician, born at Falun. He became professor of political economy at the

University of Upsala in 1882, and later its rector. Becoming a member of the Riksdag in 1888, he came to have great influence in the councils of the Conservative party. He published many historical works, including *Bidrag till svenska rådets historia under medeltiden* (1872); *Sveriges Historia, 1511-1611* (1878); *Bidrag till svenska statsricketets historia* (1884-87); *Den svensk-norsk Unionen* (2 vols., 1889-91); *Fjerde Artiklen af Fredstraktaten i Kiel, 1814* (1899).

ALI PASHA, ä'lë på-shä' (1741-1822). An Albanian ruler, notorious for cruelty, and known as "the Lion of Janina." He was born at Tepeleni, in the Albanian province of Janina. His father, one of the Albanian beys, died in Ali's boyhood, and the rearing of the child was thus left to his mother, a vindictive and merciless woman, who apparently instilled into him her own spirit. His youth was passed in peril and hardship, seeking to recover the possessions of which the neighboring pashas had robbed his father. Young Ali at last had to betake himself to the mountains and even to pledge his sword to save himself from dying of hunger. At length a change came in his fortunes, and he returned to Tepeleni in triumph. On the very day of his return he murdered his brother and then imprisoned his mother on the charge of poisoning him. He helped the Porte to subdue the Pasha of Scutari and thereby obtained the lands taken from his father and several Greek cities. He also attacked and slew (with the permission of the Sultan) Selim, Pasha of Delvino, and, as a reward, was appointed Lieutenant to the new Pasha of Derwent. He used this office to enrich himself by sharing the profits of brigandage. For this he was deposed, but he bought his way back into favor. For his services in the Turkish military forces in the war of 1787 he was named Pasha of Trikala in Thessaly; at the same time he seized Janina and had himself appointed Pasha of that province. Having thus won a position of power by the most unscrupulous means, he displayed marked administrative ability. He swept his old friends, the robbers, from the mountain roads, incorporated them into military troops, quelled the wretched factions that prevailed, and everywhere introduced order in the place of anarchy by the vigor and vigilance of his administration.

In order to gain a seaport on the Albanian coast Ali formed an alliance with Napoleon. But Napoleon was defeated in Egypt, and Ali, not to be caught on the losing side, changed friends quickly and as an ally of the English soon found himself in full possession of three towns on the Adriatic. He revenged upon the inhabitants of Gardiki an injury done to his mother 40 years before, by the murder of 739 male descendants of the original offenders, who themselves were all dead. But at the same time he maintained order and justice. Security and peace reigned, highroads were constructed, and industry flourished, so that the European travelers, with whom he willingly held intercourse, considered him an active and intelligent governor. From the year 1807, when he once more entered into an alliance with Napoleon, the dependence of Ali on the Porte was merely nominal. Having failed, however, to obtain, through the influence of Napoleon, Parga, on the coast of Albania, and the Ionian Islands, he now entered into an alliance with the English, to whom he made many concessions. In

return for these they granted Parga, nominally to the Sultan, but really to Ali. As he now considered his power to be securely established, he caused the commanders of the Greek armatole (or Greek militia), who had hitherto given him assistance, to be privately assassinated one by one, while at the same time he put to death the assassins, to save himself from the suspicion of having been their instigator. The Porte at length determined to put an end to the power of this daring rebel; and in 1820 Sultan Mahmud sentenced him to be deposed. Ali put up a stiff fight, but at last surrendered, on the security of an oath that his life and property would be granted him; the Turks, however, stabbed and then decapitated him. Ali, like many other half-civilized monarchs and chiefs who have lived within the sphere of European influence, was keenly alive to whatever occurred among the powers of Christendom. Though utterly illiterate himself, he had all the foreign journals translated and read to him. He watched every political change, as if conscious that the interests of his little region depended for their future prosperity on the West, and not on the East, and made friendly advances to both the French and English. Consult: Ibrahim Manzour Effendi, *Mémoires sur le Grèce et l'Albanie pendant le gouvernement d'Ali Pacha* (Paris, 1827); Pencker, *Die Sulioten und ihre Kriege mit Ali Pascha von Janina* (Breslau, 1834); Davenport, *The Life of Ali Pasha* (London, 1837).

AL'QUOT PART (Lat. *aliquot*, some, several). One quantity or number is said to be an aliquot part of another when the quotient of the latter divided by the former is an integer; e.g., 2, 4, 5, 10, 12½, are aliquot parts of 100.

ALISCANS, ä'lë'skän', **ALESCHANS**, or **LES ALYSCAMPS**, lä zä'lë'skän' (from Lat. *Elysi Campi*, Elysian Fields). A mediæval cemetery near Arles, in the south of France, supposed to have been consecrated by an apparition of Christ himself. Hence the name of a *chanson de geste*, of the twelfth century, describing two battles fought in this place by William, Count of Orange, against the Saracens. Defeated in the first fight, he raised a new army and renewed the combat with success. The same Christian hero appears in various other *chansons* of the period.

AL'ISMA'CEÆ. A family of monocotyledonous plants, containing about 15 genera and 60 species, widely distributed in fresh-water swamps and streams. Conspicuous representatives of the group are arrow leaf or arrow head (*Sagittaria*), and water plantain (*Alisma*).

AL'ISON. The young wife of John, a rich but miserly old carpenter in Chaucer's *Miller's Tale*. She was "long as a mast and upright as a bolt," more "pleasant to look upon than a flowering pear tree," and her skin "was softer than the wool of a wether." Absolon, a parish clerk, was in love with her, but she herself loved Nicholas, a threadbare scholar lodging in her husband's house.

ALISON, Rev. ARCHIBALD (1757-1839). An English philosophical writer. He was born in Edinburgh and studied at the University of Glasgow and afterward at Oxford. He took orders in the Church of England and subsequently held several preferments, among others a prebendal stall in Salisbury, and the perpetual curacy of Kenley, in Shropshire. From 1800 he officiated in a chapel in his native city,

where he remained till his death. Alison is principally known by his *Essays on the Nature and Principles of Taste*, first published at Edinburgh in 1790. The *Essays* advocate what is called the "association" theory of the sublime and beautiful. Two volumes of his sermons, first published at Edinburgh in 1814, were very popular in their day, and reached the sixth edition in 1816. See *ÆSTHETICS*.

ALISON, Sir ARCHIBALD (1792-1867). A British lawyer, historian, and writer. He was born at Kenley, Shropshire, Dec. 29, 1792. In 1805 he entered Edinburgh University, where he obtained highest honors in Greek and mathematics. He was called to the bar in 1814 and, owing to friendly influence, presently made a handsome income, which enabled him to travel on the Continent, then sought by many young men who desired to visit the scenes of the wars against Napoleon. From 1822 to 1830 he was advocate-deputy, and made his appearance as a writer on law, politics, and literature. In 1835 he settled near Glasgow, as Sheriff of Lanarkshire, an office conferred on him the preceding year, and began systematic and unremitting public and literary work. His *History of Europe*, a popular rather than a profound book (10 vols.), begun in 1829, finished in 1842, achieved a great success. For the sixth edition, published in 1844, the author received 2000 guineas. By 1848, 100,000 copies had been sold in the United States. It was translated into several languages, including French, German, and even Arabic. A continuation of the *History* for the period 1815-1852 (9 vols.) was completed in 1859. His other works, *Life of the Duke of Marlborough* (1845), *The Principles of Population* (1840), etc., though less successful, attracted wide notice. In 1845 he was elected Lord Rector of Marischal College and in 1851 of Glasgow University. He was made D.C.L. of Oxford University, and in 1852 received a baronetcy. In politics he was an arch-Tory. He continued his labors, in health and strength, almost to the day of his death, May 23, 1867. Over 100,000 persons attended his funeral. Consult his *Autobiography*, edited by his daughter-in-law (Edinburgh, 1883).

ALISON, Sir ARCHIBALD, Jr., K.C.B. (1826-1907). A British general. He was born in Edinburgh, the son of the historian, and educated at Edinburgh and Glasgow universities. He entered the army in 1846; served in the Crimean War at the siege of Sebastopol, and in India, where he lost an arm at the relief of Lucknow; and in the Ashanti expedition of 1873-74 he commanded the European brigade. He held an active command in the Egyptian expedition of 1882-83 and was promoted to be lieutenant-general for gallantry. On his return from Egypt he commanded at Aldershot in 1883-89, in 1888 was made an adjutant-general, and in 1889 was chosen military member of the Council of India. Four years later he was retired. He published a valuable treatise on *Army Organization* (1869).

ALISON, WILLIAM PULTENEY, M.D. (1790-1859). A Scotch political economist, physician, and professor of the practice of medicine in the University of Edinburgh from 1822 to 1856. He was an elder brother of the historian and was extremely popular with all classes of the community, because of his efforts to alleviate the sufferings of the poor. A pamphlet published by him in 1840 had the effect of bring-

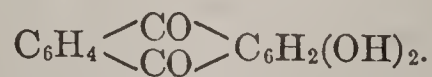
ing about an improved poor-law for Scotland. He published a work entitled *A Dissertation on the Reclamation of Waste Lands* (1850), recommending the colonization of such lands by paupers and criminals, and several books upon medical subjects, among which may be mentioned his complete treatises on general pathology entitled *Outlines of Physiology* (3d ed., 1831), and *Outlines of Pathology and Practice of Medicine* (1844).

A'LITHE'A. The name of a character in Wycherley's play, *The Country Wife*, and in Garrick's *Country Girl*. She is a self-possessed and witty woman of the world.

ALIZ'ARIN (probably from Ar. *al*, the + 'asūrah, juice extracted from a plant), sometimes called madder extract. An exceedingly valuable coloring matter. With the oxides of aluminium, iron, and most other metals, it gives a series of beautifully colored insoluble salts or lakes. It was first obtained from madder (the root of *rubia tinctoria*), which has been used for ages in dyeing Turkey-red on cotton. In 1868 Graebe and Liebermann discovered a process by which it could be manufactured from anthracene, thus for the first time artificially producing a natural coloring substance. Their method, since modified with a view to economy, consists in the following operations: (1) *Anthracene*, a hydro-carbon contained in the refuse coal-tar of gas works, is oxidized with potassium bichromate to yield the compound *anthraquinone*; (2) when anthraquinone is heated with fuming sulphuric acid, *anthraquinone-sulphonic acids* are produced; (3) if the sodium salts of these acids are kept for 48 hours, in closed cylinders, with caustic soda and potassium chlorate, at a temperature of 180° C., the sodium salts of *alizarin* and similar compounds, called *purpurins*, are obtained; (4) the sodium salts of alizarin and purpurin are then dissolved in water, and, by addition of hydrochloric acid, alizarin itself and the purpurins are set free and precipitated in crystalline form. The precipitate is collected in filter-presses, thoroughly washed with water, and brought into the market in the form of a rather thin paste usually containing either 10 or 20 per cent of alizarin. Pure alizarin can be readily obtained from this paste by sublimation. Alizarin was first made on an industrial scale by Perkin in 1869.

Alizarin is to some extent soluble in hot water. In the dyeing processes fabrics are first soaked in a solution of the required mordant, and after the latter has been decomposed by steam or with alkali, leaving an insoluble metallic hydroxide in the fibre, alizarin solution is applied to produce the desired "lake."

Chemically, alizarin is a dioxy-anthraquinone, having the structural formula



Nitro-alizarin (commercial *alizarin orange*), which is itself a coloring matter, yields, when heated with glycerin and sulphuric acid, another color, *alizarin blue*, used in calico printing. *Alizarin carmin* is another important alizarin color; it is much used as a substitute for cochineal.

The artificial production of alizarin on a large industrial scale has naturally brought about important changes in the agriculture of

the countries where madder used to be extensively cultivated. Consult: Auerbach, *Das Anthracen und seine Derivate* (2d ed., Brunswick, 1880); Gnehm, *Die Anthracenfarbstoffe* (Brunswick, 1897); Benedikt, *The Chemistry of the Coal-Tar Colors* (trans. by Knecht, 3d ed., London, 1900); Green, *A Systematic Survey of the Organic Coloring Matters* (London, 1904).

AL'KAHEST, or **ALCAHEST** (a word arbitrarily formed by Paracelsus after Arabic fashion). See **ALCHEMY**.

ALKAHEST, or **THE HOUSE OF CLAES** (*The Search for the Absolute*) published in 1834, is one of the most striking novels in Balzac's series *La Comédie Humaine*. Its central character, a Flemish chemist of wealth and position, devotes everything—fortune, name, health, and even sanity—to solve the mystery of matter and finally dies heart-broken and defeated.

AL'KALIES. See **ANTIDOTES**.

ALKALIES (Fr. *alkali*, ultimately from *Ar. al*, the + *kaly*, ashes of saltwort). A term applied to the compounds of hydrogen and oxygen with the metals lithium, sodium, potassium, rubidium, cesium, and the radicle ammonium. The alkalies are all soluble in water and have the property of neutralizing acids as well as of turning solutions of red litmus blue. The word "alkal," which is derived from the Arabic, and means *ash*, was originally given to the ashes of sea plants, and was applied first to potash, called the *vegetable alkali*, and then to soda, which was derived from rock salt and called *mineral alkali*. These two became known as the fixed *alkalies*, in distinction from ammonia, which was called the *volatile alkali*. The alkalies are exceedingly caustic and act as powerful corrosive poisons. They show great avidity for acids and combine with them, forming salts, in which the special properties of both acid and alkali are generally destroyed; hence they are said to neutralize one another. (See **ACIDS**.) The alkalies find extensive use in the arts, as in the manufacture of soap and of baking powders, and in dyeing. The alkaline earths, lime, magnesia, baryta, and strontia, form a group of substances closely allied to the alkalies, but differing from the latter in being less soluble and by the fact that their carbonates are insoluble in water. Consult G. Lunge, *A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali* (London, 1891), and *The Alkali-Maker's Handbook* (London, 1891). See **BASE**.

AL'KALI FLAT. See **PLAYA**.

ALKALIMETER. See **ACIDIMETRY AND ALKALIMETRY**.

AL'KALI SOILS. A term applied to soils occurring in regions of deficient or irregular rainfall, which contain unusually large amounts of soluble salts concentrated in or near the surface. Under certain conditions of moisture these salts appear on the surface of the soil in the form of a crust or powder known as *reh* in India, *sabach* in Egypt, and *alkali* in America. The main constituents of this saline efflorescence are sodium sulphate, sodium carbonate, and sodium chloride, mixed in varying proportions. There are also present salts of calcium and magnesium and smaller amounts of potassium sulphate, sodium phosphate, and sodium nitrate, these salts furnishing the most important elements of plant food. Two main classes of alkali are commonly distinguished:

"black" alkali, in which sodium carbonate predominates, and which is on this account highly corrosive and injurious to vegetation; and "white" alkali, the predominant constituent of which is sodium sulphate, and which is much less harmful to plant growth than is the black form. A saline form in which sodium chloride predominates is also frequently met with. Black alkali derives its name from the dark-colored spots which may usually be observed where it abounds, and which owe their color to the organic matter dissolved from the soil by the sodium carbonate.

Practically the same soluble (alkali) salts occur in all soils, but in humid regions the abundant rainfall prevents their accumulation on or near the surface, carrying away in the drainage those salts for which the soil has not a strong absorptive power. In regions of deficient rainfall, on the other hand, the scanty moisture which reaches the soil merely serves to dissolve the salts and carry them down a short distance into the ground, whence they are rapidly drawn up by the capillary rise of the water. The moisture, evaporating at the surface, leaves the salts accumulated there. Such accumulations of alkali are also found in regions which have a rainy and a dry season (as in parts of India), and where the rains occur commonly in sudden and violent downpours, which quickly pass without wetting the soil to any considerable depth.

In irrigated regions alkali frequently appears at the surface of the soil as a result of excessive application of water combined with defective drainage. Irrigation water, carried by canals running through porous, sandy soils, or applied in excessive amounts on the higher lands, seeps through to the lower-lying lands, carrying with it the soluble salts. Conditions are sometimes aggravated by the use of irrigation water rich in soluble salts.

Alkali soils generally occur in circumscribed areas ("spots"), but sometimes as broad stretches of "alkali deserts." Such soils are common in arid regions, i.e., where the average annual rainfall is less than 20 inches (500 millimeters). According to Hilgard, "the arid region, thus defined, includes, in North America, most of the country lying west of the one hundredth meridian, up to the Cascade Mountains, and northward beyond the line of the United States; southward, it reaches far into Mexico, including especially the Mexican plateau. In South America it includes nearly all the Pacific slope (Peru and Chile) south to Araucania; and eastward of the Andes the greater portion of the plains of western Brazil and Argentina. In Europe only a small portion of the Mediterranean border is included; but the entire African coast belt opposite, with the Saharan and Libyan deserts, Egypt, and Arabia are included therein, as well as a considerable portion of South Africa. In Asia, Asia Minor, Syria (with Palestine), Mesopotamia, Persia, and northwestern India up to the Ganges, and northward, the great plains or steppes of central Asia eastward to Mongolia and western China, fall into the same category, as does also a large portion of the Australian continent." There are extensive regions, especially in European Russia, which are not strictly arid according to this definition, but in which alkali soils are of frequent occurrence.

Alkali injures plants by its corrosive action

(in the case of black alkali) on the root crown, and by interference with osmotic action, by which seeds and plants take up the moisture and soil solutions, and thus prevents or seriously retards germination and growth. The latter effect results only when the soluble salts are present in considerable amount; on the other hand, a small amount of alkali appears to have a beneficial effect. Alkali, especially the black variety, also renders soils pasty and difficult to till and drain, and tends to form a tough hardpan impervious to water. Alkali soils are, as a rule, more moist than those free from a localized excess of soluble salts. This is due to the strong absorptive power of the salts for water and their retarding effect on evaporation.

Alkali soils are generally so fertile when freed from excess of noxious salts, and their area is so rapidly increasing under careless methods of irrigation, that the reclamation of alkali lands is a matter of the greatest agricultural importance. Alkali soils may be improved by (1) reducing surface evaporation, which may be effected by maintaining a loose tilth in the surface soil, by mulching, and by the growth of plants which root deeply and shade the soil, or which take up large amounts of soluble salts in their growth; (2) deep and thorough tillage; (3) the use (on black alkali) of chemical correctives, such as gypsum, which converts most of the corrosive carbonate into the comparatively harmless sulphate; and (4) leaching out the excess of salts by irrigation in connection with underdraining. The first two methods of treatment are merely temporary expedients, and are of value only when the amount of alkali is small. The third also affords only temporary relief, and is of value mainly when the amount of alkali is small and of the black variety. It is, however, very effective when employed in connection with the fourth method, for it improves the drainage, and tends to fix in the soil certain of the valuable fertilizing constituents, especially alkaline phosphates and humus, which would otherwise be lost in the subsequent leaching; for it must be borne in mind that, although the leaching process is effective in removing the noxious salts, it is likely to carry away with them a large part of those ingredients upon which the productiveness of the soil depends.

Alkali lands are commonly either entirely devoid of vegetation, or else produce plants of little or no value to man. Plants differ widely as regards tolerance of alkali in the soil, the tolerance depending much upon the kind and proportion of the salts present as well as upon the nature of the plant itself. Hilgard proposes to utilize the natural vegetation as an index of the kind of salts predominating in a soil. Thus, under California conditions, the samphires (*Salicornia subterminalis* and *Allenrolfea occidentalis*), alkali-heath (*Frankenia grandifolia campestris*), and *Cressa cretica truxillensis* are especially indicative of excessive amounts of salts of any kind; tussock grass (*Sporobolus airoides*) and greasewood (*Sarcobatus vermiculatus*) of the presence of large amounts of black alkali; and samphires and saltworts (*Suaeda torreyana* and *Suaeda suffrutescens*) of white alkali. The natural vegetation also furnishes, according to Hilgard, a means of determining the reclaimability of alkali soils. Thus, when tussock grass, greasewood, the samphires, saltworts, alkali-heath,

and cressa occupy the ground as an abundant and luxuriant growth, such land is considered irreclaimable for ordinary crops unless underdrained for the purpose of washing out surplus salts, as explained above. The more important and valuable of the plants which can withstand large amounts of alkali are the Australian salt-bushes (*Atriplex* spp.), *Modiola decumbens*, tussock grass (*Sporobolus airoides*), wild millet (*Beckmannia cruceiformis*), and barnyard grass (*Panicum crus-galli*). Of ordinary farm crops which show a marked tolerance of alkali may be mentioned rice, the millets, beets, English rape, sunflowers, asparagus, celery, spinach, onion, alfalfa, Bokhara clover, and grapes. The Australian salt-bushes, especially *Atriplex semibaccata*, have recently come into considerable prominence as a useful crop for alkali soils. They are highly tolerant of alkali, taking up large amounts of the soluble salts in their growth (nearly 20 per cent of the dry matter of salt-bushes is ash), and they produce a forage of considerable value.

Bibliography. E. W. Hilgard, *Soils* (New York, 1906). C. W. Dorsey, "Reclamation of Alkali Soils," and "Alkali Soils of the United States" (*U. S. Bureau of Soils, Bulletins 34 and 35, 1903*), *U. S. Bureau of Soils, Bulletins 14, 17, 18, 21, 33, 42, 43, 44, 52, Circulars 11 and 12, and Reports of Field Operations, 1899 to date* (Washington, 1900—); *U. S. Dept. Agr., Report 71* (Washington, 1902); *Farmers' Bulletin 371*; *Office of Experiment Stations, Bulletin 217*; *Reports of Wyoming Experiment Station* (Laramie, 1896-1900); T. H. Kearney, "The Choice of Crops for Alkali Lands," *U. S. Dept. Agr., Farmers' Bulletin 446*; G. P. Merrill, *A Treatise on Rocks, Rock Weathering, and Soils* (New York, 1897).

AL'KALOIDS (literally, resembling alkali). A term applied to all nitrogenous basic compounds found in plants, mostly in the monocotyledon species. They arise in plants, probably, through the decomposition of more complex nitrogenous substances; the decomposition products first found react with other substances present and turn into methyl derivatives, esters, or glucosides; finally, these derivative alkaloids combine with the acids present in the plant to form salts. The alkaloids are, as a rule, the most important medicinal principles of the plants from which they are derived, and in moderate doses constitute therapeutic agents of the highest value. In larger quantities, however, they are extremely poisonous. Most alkaloids are chemically composed of carbon, hydrogen, nitrogen, and oxygen. A very few, including the well-known nicotine of tobacco, and coniine, contain carbon, hydrogen, and nitrogen, but no oxygen. The alkaloids that contain oxygen are non-volatile solids, and can mostly be obtained in the form of colorless crystals. Those that contain no oxygen are volatile liquids. The separation of the two groups of alkaloids can therefore be readily effected by simply subjecting the given mixture to a process of distillation. Like most other substances occurring in plants, the alkaloids are optically active, generally turning the plane of polarized light to the left. See STEREO-CHEMISTRY.

Many alkaloids are chemically related to the organic bases, *pyridine*, *pyrrolidine*, *quinoline*, *iso-quinoline*, and *purine*. Thus, coniine, piperine, and trigonelline are pyridine derivatives; atropine, cocaine, ecgonine, and nicotine are

pyrrolidine derivatives; brucine, cinchonidine, cinchonine, quinine, and strychnine are quinoline derivatives; hydrastine, narceine, narcotine, and papaverine are iso-quinoline derivatives; while caffeine, theobromine, and theophylline are purine derivatives and therefore relatives of uric acid. The parent substances (pyridine, quinoline, etc.) of the alkaloids, appear in the free state when the latter are subjected to such violent reactions as fusion with caustic soda or potash, strong heating with phosphoric acid, distillation with zinc dust, or the like. Most alkaloids contain one or more methoxyl (OCH₃) groups. The presence of these, and the number of them present, may be determined by Zeisel's method, which consists in boiling the given alkaloid with hydro-iodic acid; the result is that the methoxyl groups present are replaced by hydrogen atoms, while as many methyl iodide molecules appear as a by-product as there were methoxyl groups in the alkaloid molecule.

In recent years important advances have been made in our knowledge of the constitution of the alkaloids, and many of these substances have been obtained synthetically. Some of the more valuable results of recent study are incorporated in the list given below and in special articles under the names of the more important alkaloids.

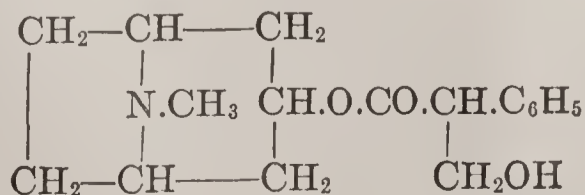
In contradistinction to the true, or *natural alkaloids*, a certain number of substances not found ready-formed in nature, but prepared artificially in the chemical laboratory, have been termed *artificial alkaloids*. Antipyrine, kairine, thalline, and the ordinary acet-anilide, or anti-febrine, are examples of artificial alkaloids, which resemble the natural alkaloids in their physiological action.

The separation and detection of the several alkaloids is often a matter of great importance in medico-legal examinations. The analytical method usually employed (the so-called Stas-Otto method) consists in partially separating the given mixture by the use of water, alcohol, ether, chloroform, benzine, and amyl alcohol, then applying tests depending upon the characteristic reactions of the various constituents. Tannic, picric, and phospho-molybdic acids, potassium-mercuric iodide, and a few other reagents form insoluble precipitates with the alkaloids.

The following are the more important natural alkaloids, their characteristic properties, and the sources from which they are obtained.

Aconitine, C₃₁H₄₇NO₁₁; melting point, 184° C.; insoluble in water; soluble in alcohol, ether, and chloroform; a violet coloration is produced when its solution in phosphoric acid is cautiously evaporated. It is found in aconite, the tuber of *Aconitum napellus* Linné.

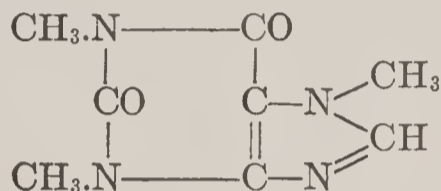
Atropine, or *Daturine*, C₁₇H₂₃NO₃; melting point, 115° C.; soluble in alcohol and chloroform; sparingly soluble in hot water and in ether. It does not exist ready-formed in nature, but is produced by the transformation of the alkaloid hyoscyamine. Atropine has been reproduced synthetically. Its constitution is represented by the formula:



Berberine, C₂₀H₁₇NO₄+4.5H₂O; melting point, 120° C.; soluble in hot water or alcohol; its aqueous solution is colored red by chlorine. It is found in yellow puccoon, the rhizome and roots of *Hydrastis canadensis* Linné; also, in Canadian moonseed, the rhizome and roots of *Menispermum canadense* Linné, and in other plants.

Brucine, C₂₃H₂₆N₂O₄+4H₂O; melting point, 100° C.; soluble in alcohol and in chloroform. It imparts to strong nitric acid a red coloration that gradually changes to yellow; the coloration becomes violet on addition of stannous chloride. It is found along with strychnine, in nux vomica.

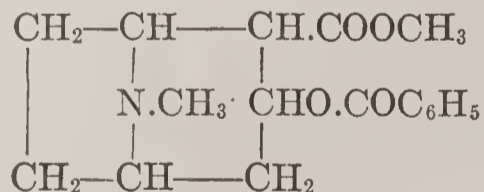
Caffeine or *Theine*, C₈H₁₀N₄O₂; melting point, 230.5° C.; soluble in hot water and in chloroform; sparingly soluble in hot alcohol. If its solution in chlorine water is evaporated and ammonia added to the residue, the latter turns purple. It is found in many plants and is contained in considerable quantities in tea and coffee. Caffeine has been reproduced synthetically. Its constitution is represented by the formula:



Cinchonidine, C₁₉H₂₂N₂O; melting point, 200.5° C.; soluble in chloroform and in alcohol. It is lævo-rotatory (i.e., its solutions turn the plane of polarized light to the left). It is found along with quinine in cinchona bark. Cinchonidine is probably a stereo-isomer (see STEREO-CHEMISTRY) of cinchonine.

Cinchonine, C₁₉H₂₂N₂O; melting point about 240° C.; sparingly soluble in chloroform and in hot alcohol. It is dextro-rotatory and is found in cinchona bark. Cinchonine has not yet been synthesized, and its constitution is not quite completely established.

Cocaine, C₁₇H₂₁NO₄; melting point, 98° C.; soluble in alcohol and in ether; sparingly soluble in water. It produces local anæsthesia when injected subcutaneously or applied to mucous membranes. It is found in coca, or cuca, the leaves of *Erythroxylon coca* Lamarek. Cocaine has been reproduced synthetically. Its constitution is represented by the formula:

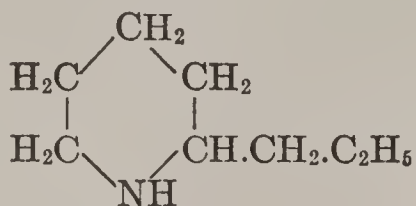


Codeine, C₁₃H₂₁NO₃; melting point, 155° C.; soluble in alcohol, chloroform, and ether. With strong sulphuric acid and chloride of iron it gives a blue coloration. It is one of the alkaloids contained in opium.

Colchicine, C₂₂H₂₅NO₆; melting point, 145° C.; soluble in water, alcohol, and chloroform. It imparts to strong nitric acid a violet color which gradually turns brown. It is the active principle of colchicum root, the corm of *Colchicum autumnale* Linné.

Coniine, C₈H₁₇N; boiling point, 168.5° C.; soluble in alcohol, ether, and chloroform; sparingly soluble in water. Its aqueous solution gives a brown precipitate with a solution of iodine. Coniine has dextro-rotatory power. It

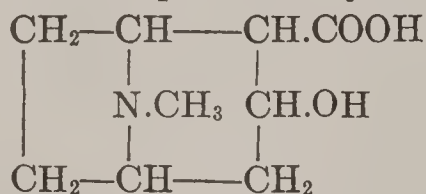
is the active principle of hemlock, the fruit of *Conium maculatum* Linné. Coniine has been reproduced synthetically. Its constitution is represented by the formula:



Curarine. $\text{C}_{18}\text{H}_{35}\text{N}$ (or $\text{C}_{10}\text{H}_{15}\text{N}?$); a yellow powder, soluble in water and in alcohol; turns purple if treated with strong hydrochloric acid. It is the active principle of the South American arrow poison curare, which is made from certain plants, including species of *Strychnos*.

Daturine, see *Atropine*, above.

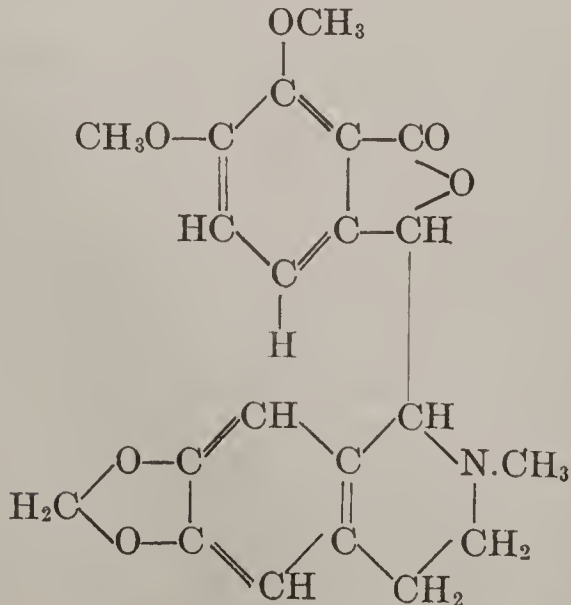
Ecgonine, $\text{C}_9\text{H}_{15}\text{NO}_3$; melting point, 205°C .; soluble in water and in ethyl acetate; sparingly soluble in alcohol and ether; insoluble in acetone, chloroform, toluene, carbon disulphide, and carbon tetrachloride. It occurs together with cocaine in coca, the leaves of *Erythroxylon coca* Lamarck. It has been reproduced synthetically, and its constitution, which is very similar to that of cocaine, is represented by the formula:



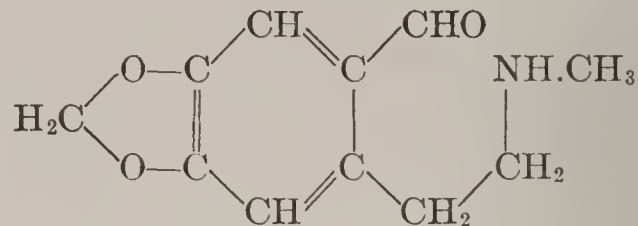
Emetine, $\text{C}_{30}\text{H}_{40}\text{N}_2\text{O}_5$ (or $\text{C}_{28}\text{H}_{40}\text{N}_2\text{O}_5?$); melting point, $62^\circ - 65^\circ \text{C}$.; soluble in alcohol, ether, and chloroform; gives with a solution of sodium molybdate in strong sulphuric acid a brown coloration which turns blue on addition of hydrochloric acid. It is the active principle of ipecac, the root of *Cephaelis ipecacuanha*.

Eserine, or *Physostigmine*, $\text{C}_{15}\text{H}_{21}\text{N}_3\text{O}_2$; melting point, $40^\circ - 45^\circ \text{C}$.; soluble in alcohol, ether, and chloroform; bleaching powder colors its solution red, but the color disappears again on addition of an excess of bleaching powder. It is the active principle of Calabar bean, the seed of *Physostigma venenosum* Balfour.

Hydrastine, $\text{C}_{21}\text{H}_{21}\text{NO}_6$; melting point, 132°C .; soluble in chloroform and in benzine, sparingly soluble in ether and alcohol, almost insoluble in water. Two drops of dilute potassium permanganate solution, added to a solution of hydrastine sulphate, produce an intense blue fluorescence. Hydrastine occurs, together with berberine (see above) in yellow puccoon, the rhizome and roots of *Hydrastis canadensis* Linné. Its constitution is represented by the formula:



Hydrastinine, $\text{C}_{11}\text{H}_{13}\text{NO}_3$; melting point, $116^\circ - 117^\circ \text{C}$.; extremely soluble in alcohol, ether, and chloroform; sparingly soluble in hot water; in the form of its hydrochloride it is used as a reliable remedy for menorrhagia and metrorrhagia. It does not exist ready-formed in nature, but is produced by oxidizing hydrastine (see above) with nitric acid. Its constitution is represented by the formula:

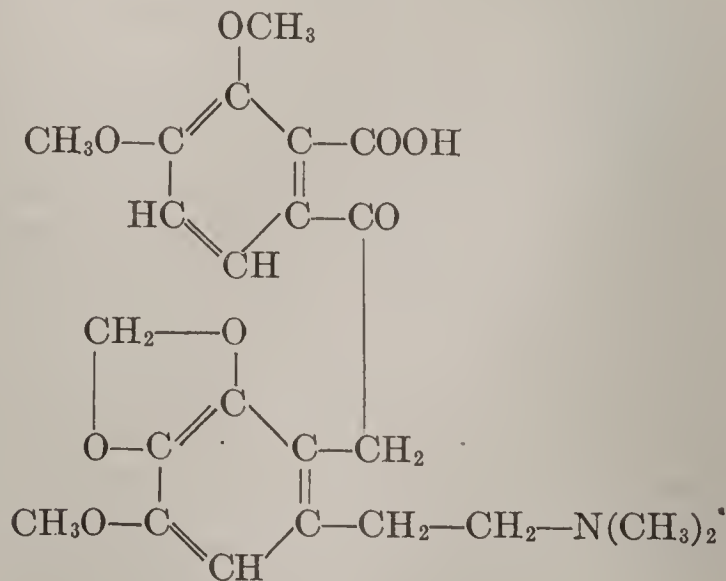


Hyoscyamine, $\text{C}_{17}\text{H}_{23}\text{NO}_3$; melting point, 108.5°C .; soluble in water, alcohol, ether, and chloroform; gives a purple color with strong nitric acid. By the action of caustic alkalies it is readily transformed into the alkaloid atropine (see above). Hyoscyamine is found in many plants of the natural order *Solanaceæ*; e.g., in henbane, the leaves and flowering tops of *Hyoscyamus niger* Linné, and in the leaves of *Atropa belladonna* Linné.

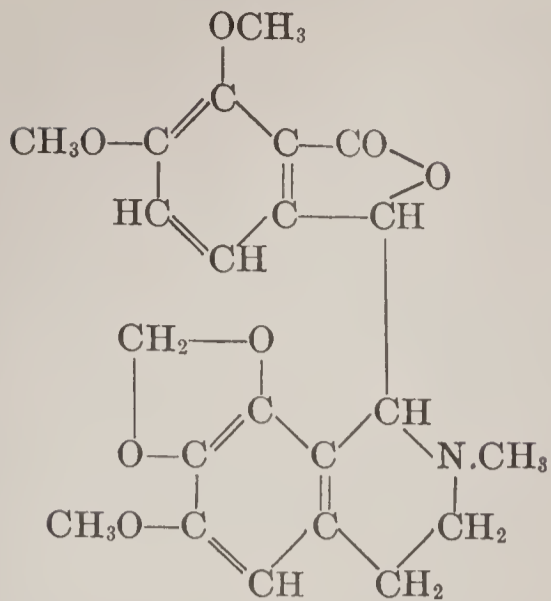
Morphine, $\text{C}_{17}\text{H}_{19}\text{NO}_3$; melting point, 230°C . It may be extracted from alkaline solutions by means of chloroform. With strong nitric acid it gives a blood-red coloration that gradually turns yellow. It is one of the constituents of opium.

Muscarine, $\text{C}_5\text{H}_{15}\text{NO}_3$; a liquid soluble in water and in alcohol; insoluble in ether and chloroform. It is found in the fly fungus, *Amanita muscaria*.

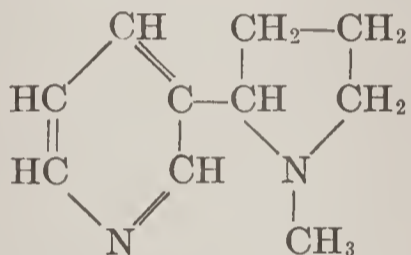
Narceine, $\text{C}_{23}\text{H}_{29}\text{NO}_9$; melting point, 145.2°C .; sparingly soluble in the ordinary solvents. A solution of sodium molybdate in strong sulphuric acid gives a green coloration that turns dark-red. It is one of the constituents of opium and resembles morphine in its physiological action. Its constitution is represented by the formula:



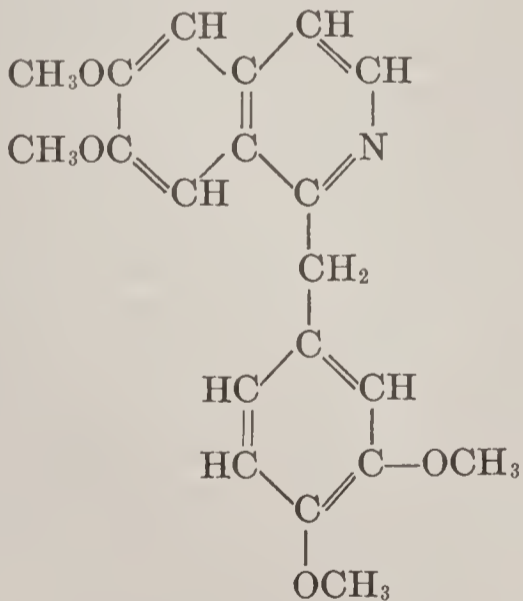
Narcotine, $\text{C}_{22}\text{H}_{23}\text{NO}_7$; melting point, 176° ; soluble in chloroform, less soluble in hot alcohol and ether. Its solutions are laevo-rotatory, but when acidified turn the plane of polarized light to the right. It is one of the constituents of opium. Its chemical constitution is represented by the formula:



Nicotine, $C_{10}H_{14}N_2$; boiling point, $241^\circ C.$; soluble in water, alcohol, and ether; its smell and taste are like those of tobacco. With hydrochloric acid it gives a violet coloration that turns orange on addition of nitric acid; with iodine solutions it gives a yellow precipitate. It is the active principle of tobacco, the dried leaves of *Nicotiana tabacum*; tobacco smoke, however, contains no nicotine. Nicotine was reproduced synthetically by Pictet in 1903. Its constitution is represented by the formula:



Papaverine, $C_{20}H_{21}NO_4$; melting point, $147^\circ C.$; soluble in hot alcohol and in chloroform; gives a violet coloration with strong sulphuric acid. It is found in opium. Its chemical constitution is represented by the formula:



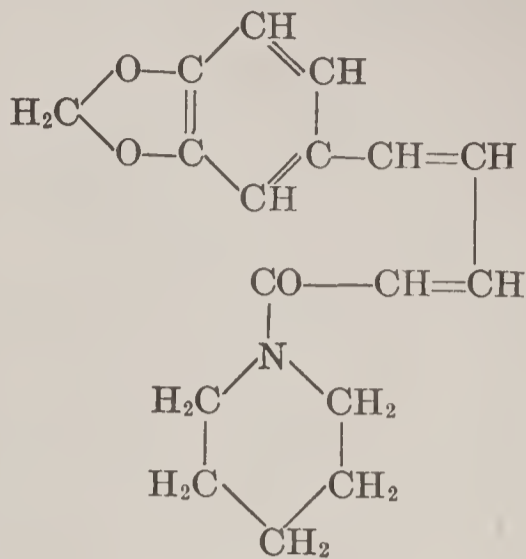
Physostigmine, see *Eserine*, above.

Pilocarpine, $C_{11}H_{16}N_2O_2$; a semi-fluid alkaloid soluble in alcohol, ether, and chloroform; gives a green coloration with strong sulphuric acid and potassium bi-chromate. It is one of the active principles of pilocarpus, or jaborandi, the leaflets of *Pilocarpus selloanus* Engler, or of *Pilocarpus jaborandi* Holmes.

Piperidine, $C_5H_{11}N$; a liquid alkaloid produced by the decomposition of piperine, a substance found in pepper.

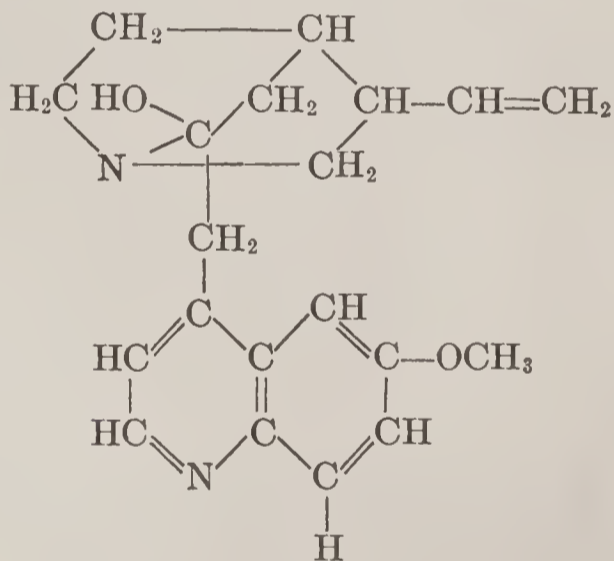
Piperine, $C_{17}H_{19}NO_3$; melting point, $128^\circ C.$; soluble in hot water and in chloroform; with strong sulphuric acid it gives a yellow color that changes to brown, then to a greenish brown.

It is found in plants of the natural order *Piperaceæ*, and is one of the chief constituents of ordinary black pepper. Piperine has been reproduced synthetically. Its chemical constitution is represented by the formula:



Quinidine, $C_{20}H_{24}N_2O_2$; melting point, $168^\circ C.$; soluble in chloroform, less so in alcohol and ether; sparingly soluble in water; its solution turns the plane of polarized light to the right. It is found in cinchona bark.

Quinine, $C_{20}H_{24}N_2O_2 + 3H_2O$; melts in its water of crystallization at $57^\circ C.$, loses its water at 100° , then melts again at $177^\circ C.$; soluble in alcohol, ether, and chloroform; sparingly soluble in water; its solutions turn the plane of polarized light to the left. It is found in cinchona bark. Quinine probably has the constitution represented by the following formula:



Solanine, $C_{42}H_{73}NO_{15}$; melting point, $235^\circ C.$; it may be extracted from its alkaline solutions by means of chloroform; with strong sulphuric acid it gives an orange coloration that turns a brownish red. It is found in bitter-sweet (woody nightshade), the young branches of *Solanum dulcamara* Linné.

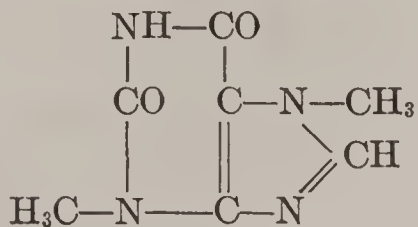
Strychnine, $C_{21}H_{22}N_2O_2$; melting point, about $264^\circ C.$; soluble in chloroform and in hot alcohol; sparingly soluble in water and in ether. It gives a pretty display of colors with strong sulphuric acid and a grain of potassium bi-chromate. It is found in plants of the natural order *Loganiaceæ* and is usually obtained from nux vomica.

Thebaine, or *Paramorphine*, $C_{19}H_{21}NO_3$; melting point, $193^\circ C.$; soluble in alcohol and chloroform; gives, with strong sulphuric acid, a dark-red coloration which turns yellow. It is found in opium.

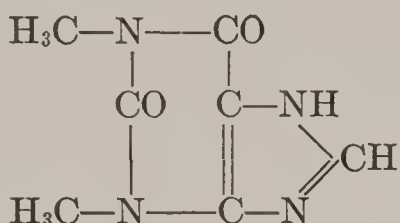
Theine, see *Caffeine*, above.

Theobromine, $C_7H_5N_4O_2$; sublimes without melting at $290^\circ C.$; sparingly soluble in the ordinary solvents; may be extracted from an

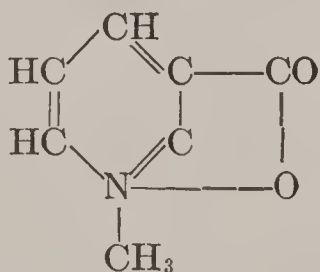
alkaline solution by means of chloroform. On evaporation with chlorine-water a brown residue is obtained that turns purple if a little ammonia is added. It is found in cacao beans. Theobromine has been reproduced synthetically. Its chemical constitution is represented by the formula:



Theophylline, $\text{C}_7\text{H}_8\text{N}_4\text{O}_2$; melting point, 264°C .; soluble in warm water, sparingly soluble in cold alcohol. When a chlorinated solution of theophylline is evaporated to dryness, a scarlet residue is obtained, which turns violet on addition of ammonia. Theophylline is found, together with caffeine, in tea. Its chemical constitution is represented by the formula:



Trigonelline, $\text{C}_7\text{H}_7\text{NO}_2$; melting point, 218°C .; extremely soluble in water, less soluble in alcohol; insoluble in ether, chloroform, and benzene; not affected by hot concentrated sulphuric acid. It is found in the seeds of *Trigonella fœnum græcum* and of *Strophantus hispidus* and in the roots of *Strophantus kombé*. It has been reproduced synthetically. Its constitution is represented by the formula:



Veratrine, $\text{C}_{32}\text{H}_{49}\text{N}_6\text{O}_9$; a mixture of two isomeric alkaloids; melting point, 155°C .; soluble in alcohol, ether, and chloroform; gives a red coloration if heated with strong sulphuric or with fuming hydrochloric acid. It is found in the seed of *Asagraea officinalis* Lindley.

The extraction of an alkaloid from the plant in which it occurs is often a matter of considerable difficulty. The volatile alkaloids may be obtained by distilling the plant or vegetable product with water and lime (or caustic soda); the liquid distilling over is neutralized with sulphuric acid and evaporated to dryness; the sulphate of the alkaloid may then be dissolved out of the residue by means of a mixture of alcohol and ether. To extract a non-volatile alkaloid, the plant is macerated and treated with a dilute solution of some acid in ordinary alcohol; the solution thus obtained is rendered alkaline by the addition of soda, and the alkaloid set free is either directly obtained in the form of a precipitate, or else may be extracted from the alkaline solution by means of ether, chloroform, or some other solvent that does not mix with water. Such processes, however, usually yield not one single, but mixtures of two or more alkaloids, and those contaminated with

large quantities of other organic substances, which often render the isolation of a single alkaloid in the pure state very difficult.

Most alkaloids have a powerful physiological action even if employed in very small quantities. The action of certain alkaloids is, however, at least partly antagonistic to the action of certain others. For this reason one alkaloid may sometimes be employed to relieve the poisonous effect of another alkaloid, though it may itself be a violent poison. The antagonism of morphine and atropine is of considerable value in cases in which a subcutaneous injection of morphine is indicated: the cardiac depression, indigestion, and constipation, usually caused by morphine, may be prevented by injecting simultaneously a trace of atropine.

The alkaloids are sometimes spoken of as vegetable bases, natural organic bases, or vegetable alkaloids. The latter name is applied to them in contradistinction to the animal alkaloids, or *ptomaines*, that are formed during the putrefaction of animal products. Like the vegetable alkaloids, the ptomaines are highly poisonous nitrogenous bases, and they resemble the vegetable alkaloids both in their chemical properties and in their physiological action. See PTOMAINES.

Bibliography. Pictet, *La constitution chimique des alcaloïdes végétaux* (2d ed., Paris, 1897; Eng. trans., New York, 1904); Dupuy, *Alcaloïdes* (Brussels, 1887–89); Brühl, *Die Pflanzenalkaloide* (Brunswick, 1900); Schmidt, *Ueber die Erforschung der Konstitution und die Versuche zur Synthese wichtiger Pflanzenalkaloide* (Stuttgart, 1900); Schmidt, *Die Alkaloidchemie in den Jahren 1900–1904* (Stuttgart, 1904); Schmidt, *Die Alkaloidchemie in den Jahren 1904–1907* (Stuttgart, 1911); Schmidt, *Die Alkaloidchemie in den Jahren 1907–1911* (Stuttgart, 1911); Stewart, *Recent Advances in Organic Chemistry* (London and New York, 1908); Fränkel, *Arzneimittel Synthese*. The most important alkaloids are described in some detail under their special names. See also STOVAINE.

'ALKAMA IBN ABADA AL TAMIMI AL FAHL. A famous Arabian poet, living in the sixth and the beginning of the seventh centuries. He sang in his kasidas the wars between the Lahmids in Hira and the Ghassanids in Bosra, and entered into poetic contests with Amr al Kais. It is said that Jundab, the wife of 'Amr al Kais, in deciding such a contest, gave the victory to 'Alkama, with the consequence that she was divorced and married the latter poet. Through the recital of some of his poems he freed his brother Sha's and some other Tamimites from captivity in 583 A.D. His diwan has been published by Socin, *Die Gedichte des Alkama al Fahl* (Leipzig, 1867), with a German translation, and by Ahlwardt, *The Diwans of the Six Ancient Arabic Poets* (London, 1870), without a translation.

AL'KANET (dim. of Sp. *alcana*, *alheña*, from Ar. *al*, the + *hinnā*), *Anchusa*. A genus of plants belonging to the family Boraginaceæ and not natives in America. Some of the species are cultivated on account of their hardiness and their blue or purple flowers, which are in coiled clusters suggesting those of the forget-me-not. The common alkanet (*Anchusa officinalis*) grows in dry and sandy places, and by waysides, in the middle and north of Europe. The roots, leaves, and flowers were formerly

used in medicine as an emollient, cooling, and soothing application. The evergreen alkanet (*Anchusa sempervirens*) is also a native of Europe, and a doubtful native of Great Britain, although not uncommon in situations to which it may have escaped from gardens, being often cultivated for the sake of its beautiful blue flowers, which appear early in the season, and for its leaves, which retain a pleasing verdure all winter. It is a plant of humble growth, rising only a few inches above the ground. A number of other species are occasionally seen in our flower borders. *Anchusa tinctoria*, to which the name alkanet or alkanna (Ar. *al-chenneh*) more strictly belongs, is a native of the Levant and of the south of Europe, extending as far north as Hungary. The root is sold under the name of alkanet or alkanna root; it is sometimes cultivated in England; but the greater part is imported from the Levant or the south of France. It appears in commerce in pieces of the thickness of a quill or of the finger, the rind blackish externally, but internally of a beautiful dark-red color, and adhering rather loosely to the whitish heart. It contains chiefly a resinous red coloring matter, to which the name "alkanet" is often applied. See ALKANET, below.

ALKANET. A beautiful red coloring matter obtained from the roots of the alkanet or orchanet herb (*Anchusa tinctoria*, Tausch.) and largely used for imparting a red color to varnishes, cosmetics, etc. It is extracted from the roots by means of benzine, and, on evaporating the latter, is obtained in the form of a thick paste that is insoluble in water, but readily soluble in alcohol, ether, benzine, various oils, and other organic liquids. Alkanet should not be confounded with the red coloring matter contained in the roots of the henna, or alcanna, plant (*Lawsonia inermis* L.). The chemical composition of purified alkanet seems to correspond to the formula $C_{15}H_{14}O_4$.

AL'KEKEN'GI. See PHYSALIS.

AL-KHUWARIZMI, ʾal-kū'wā-rīz'mê, ABU 'ABD ALLAH MOHAMMED IBN MUSA, of Khwarezm, a mediæval State included in the present Khanate of Khiva (?-c.831). A Moslem philosopher and celebrated algebraist. He was one of the savants who went to Bagdad in Al-Mamun's reign. He worked in the observatory there, computed a set of astronomical tables, and wrote several works on mathematics. Among these works were treatises on the Hindu arithmetic (trans. Gerard of Cremona, or Adelard of Bath; published by Boncompagni, Rome, 1857), the sundial, the astrolabe (an instrument used to take the altitude of the sun), on chronology, geometry, and algebra. His *Al-jabr wa'l muqabalah*, i.e., the redintegration and the comparison, gave the name to algebra (q.v.). His discussion of the quadratic equation, in which he called to his assistance geometric diagrams, is quite complete. His name appeared in Latin in the form *Algoritmi*, from which we have our word "algorism" (q.v.). His algebra was translated into Latin by Gerard of Cremona, and into English by F. Rosen (London, 1831). Consult Brockelmann, *Geschichte der arabischen Litteratur* part i, p. 215 (Weimar, 1898).

AL KINDI. See KINDI.

ALKMAAR, ʾalk-mār'. An old town in the province of north Holland, in the Netherlands, situated on the North Holland Canal, 20 miles northwest of Amsterdam (Map: Netherlands,

C 2). It is well built, has very clean streets, and is intersected by broad canals. It possesses a town-house, ornamented with curious Gothic carving, with a tower, a museum of antiquities, and a library, and the church of St. Laurence, which dates from the fifteenth century. It is a centre of trade in grain, butter, and cheese. Alkmaar exports great quantities of the last-mentioned commodity, more than one-half the output of the province passing through this town. There are minor maritime industries. It is the birthplace of Henry of Alkmaar. (See ALKMAAR, HEINRICH VON.) Alkmaar, first of all the Netherland cities, successfully resisted the Spanish in 1573, and the anniversary of that siege was commemorated in 1873 by the erection of a statue of Victory, by Stracké. Here, on Oct. 18, 1799, the Duke of York signed a capitulation, by the terms of which the Russo-British army, twice defeated by the French under Brune, left Holland. Pop., 1890, 15,803; 1900, 18,275; 1910, 21,374.

ALKMAAR, HEINRICH VON. A low German translator or adapter of the famous animal epic, *Reynard the Fox* (*Reineke Fuchs*) (q.v.), printed in 1498. Alkmaar is said to have been a tutor of the Duke of Lorraine in the latter part of the fifteenth century. See ANGLO-NORMAN LITERATURE.

AL'KOREM'MI. In William Beckford's romance of *Vathek* (q.v.), the name of Vathek's palace, to which he had added five parts, corresponding to his five senses.

AL'LA, or EL'LA. In Chaucer's *Man of Law's Tale*, the name of the king who marries Constance.

ALLA BREVE, ʾal'lâ brâ'vâ (It. according to the *breve*). In music, a species of common time with a quick movement. In early ecclesiastical music we find no terms indicating the tempo or rate of movement, until, in the fifteenth century, the expressions *augmentation* and *diminution* were introduced to indicate that note values were to be changed by lengthening or shortening. The sign of diminution was a vertical line drawn through the time signature; \emptyset for triple and \emptyset for duple time. With this diminution, breves (q.v.) were to be taken in the time of semi-breves, thus quickening the movement. At that time the unit of count was a semi-breve. When the breve was "diminished," it meant that one must count "by the breve," hence the name Alla Breve.

In modern music Alla Breve measure (sometimes called Alla Cappella) is marked \emptyset or $\frac{2}{2}$

and calls for two counts to the bar, with half notes as the unit. See MENSURABLE MUSIC.

ALLAH. The name of the deity used by Mohammedans. It is generally supposed to be a contraction of *al ilahu*, 'the god,' but may be derived from the Aramaic *alaha*, which has the same meaning. Among the Nabataean inscriptions from Hejra names like Abd allaha, Abd allahi, Zaid allaha, Saad allahi, Wahab allahi, and Taim allahi are of frequent occurrence (*Corpus Inscr-Sem.*, ii, 238, 302, 315, 369, 358, et al.). These are several centuries earlier than Mohammed. In the Safaitic inscriptions the name "Allah" occurs alone. Pre-Islamic poets mention Allah as a great god; and many passages in the Koran show that the Arabs in "the time of ignorance" used the name. Wellhausen supposes that it was employed as an appellative

for the local god of Mecca, Hubal (q.v.). Hubal himself is found among the Aramaic-speaking Arabs of N. W. Arabia and was probably an importation from the North. The conception of Allah in the Koran and in the succeeding Moslem schools of theology has been best described by McDonald. Consult: Wellhausen, *Reste Arabischen Heidentums*, pp. 217 (2d ed., 1907); Nöldeke, 'Arabs' in *Encyclopædia of Religion and Ethics* (1908); McDonald, 'Allah' in *Enzyklopædie des Islams* (1910).

ALLAHABAD, ä'l'lä-hä-bäd'. A district and a division of the United Provinces of Agra and Oudh, British India.

ALLAHABAD (Ar. *Allah*, God + Hind. *abad*, city, dwelling). The seat of the government of the United Provinces of Agra and Oudh (formerly the Northwest Provinces), British India (Map: India, D 3). It occupies the fork of the Ganges and Jumna which forms the lowest extremity of the extensive region distinguished as the Doab, or the Country of Two Rivers, lying between those natural boundaries. Its position at the confluence of the holy rivers, which has long made it a centre of superstitious reverence and worship, and a much frequented place of pilgrimage for the purposes of ablution, also rendered it a natural centre of commerce and civilization, an advantage which has been fully appreciated by the British government. It commands the navigation both of the Ganges and of the Jumna. It is on the direct water-route between Calcutta and the Upper Provinces, and is a main station on the Grand Trunk Road and also on the East Indian Railway. Allahabad is 72 miles west of Benares; is distant from Calcutta, by land, 496 miles; by water, 808 miles in the rainy season, 985 miles in the dry season. From Delhi it is distant 386 miles, and from Bombay, by the Jabalpur branch of the East Indian Railway, 840 miles. The cotton, sugar, and indigo produce of the fertile district of Allahabad is brought in large quantities into the city, to be transported thence to Calcutta and elsewhere. Steamers sail to Calcutta and barges to Delhi.

In point of appearance, Allahabad is scarcely worthy of its character and renown. With the exception of a few ancient monuments of costly, elaborate, and tasteful workmanship, the native part of the city consists of mean houses and a network of narrow streets. The most noteworthy buildings are the Jumma Musjid, or the great mosque, and the Sultan Khossor's caravansary—a fine cloistered quadrangle. The fort is of red stone and is approached by a very handsome gate; it contains the palace or residency, and the famous Asoka or Gada Pillar, the club of Bhin Sen, 240 B.C. Below the fort, built over "the undying banyan tree," is the subterranean Chali Satum temple, which is said to communicate with Benares by an underground passage, through which flows a third holy river, the Sereswati, visible only to the eye of faith, the dropping moisture on the rocky walls pointed out as the river scarcely justifying the presumption. Allahabad possesses a hospital, theatres, bazaars, etc., and the Muir Central College (founded 1872), the chief educational institution in the United Provinces. (See INDIA.) As generally in the towns of India, the European quarter is vastly superior. Its nucleus appears to have been the native fort, which on the east and south rises directly from the banks of both rivers, while toward the land its artificial de-

fenses, of great strength in themselves, are not commanded from the neighborhood by any higher ground. This citadel, described by Heber as having been at one time "a very noble castle," has lost much of its romance by having had its lofty towers pruned down to bastions and cavaliers. The Europeans of the garrison occupy well-constructed barracks. Beyond the fort are the cantonments for the native troops. In connection with these are numerous villas and bungalows, few other spots in India boasting such handsome buildings of this kind, which are rendered still more attractive and agreeable by avenues of trees winding between them and connecting them with the fort, the city, and several of the adjacent localities. Two boat bridges cross the Ganges, and the East Indian railway-bridge spans the Jumna at Allahabad. So many poor pilgrims throng the city, especially at the time of the great annual religious fair in January, that instead of Allahabad, the natives call it "Fakirabad," or the city of beggars. The pilgrims assemble to bathe at the confluence of the rivers, and in 1904 it was estimated that 250,000 were present on the great bathing day. Every twelfth year the gathering is much larger; a million people are said to have been present in 1894. From the octroi, professional and carriage taxes, rents and proceeds of the Hindu fair, a considerable municipal revenue accrues, which is expended on police, lighting, street sprinkling, water works, maintenance of parks, medical assistance, and charities. Allahabad was founded by Akbar in 1575, on the site of an ancient fort. From 1765 to 1801 it underwent three changes of rulers, coming in the latter year under British domination. The mutiny of 1857 brought disaster to Allahabad. On the 6th of June of that year, the insurrection, which had begun at Meerut on the 10th of May, extended itself to Allahabad. Though the Europeans held the fort, the mutineers were for some days undisputed masters of all beyond; and between the ravages of the marauders and the fire of the garrison, the city became little better than a heap of blackened ruins. New buildings began to spring up as soon as order had been restored, and most of the city has been rebuilt since that date, with the exception of the few monuments of ancient native architecture described above. Pop. (including cantonments), 1891, 175,246; 1901, 172,032; 1911, 171,697.

ALLAIN-TARGE, ä'län' tär'zhâ', FRANÇOIS HENRI RENÉ (1832–1902). A French politician, born at Angers. He studied law at Poitiers, was admitted to the bar in 1853, and from 1861 to 1864 was substitute Imperial Procurator at Angers. From 1864 to 1866 he was an editor of the *Courrier du Dimanche*. He joined the staff of the *Avenir National* in 1868, and in the same year founded the *Revue Politique*. Upon the fall of the Empire, he was appointed by the government for national defense Prefect of the department of Maine-et-Loire. He was subsequently an army commissary, and resigned with Gambetta upon the conclusion of peace. He was a municipal Councilor of Paris in 1871 and 1874, Deputy in 1876, 1877, and 1881, and Minister of Finance in Gambetta's cabinet. In 1885–86 he was Minister of the Interior in the cabinet of Brisson.

AL'LAMAN'DA (named after the Swiss scientist Allamand, who died in 1787). A genus of about 12 species belonging to the family Apocynaceæ, and natives of Central and South

America. A number of species are cultivated as greenhouse shrubs, mostly climbers, with whorled leaves and large terminal funnel-shaped flowers. *Allamanda cathartica*, a native of the West Indies, is a climber with whorled or opposite oblong leaves, and golden-yellow flowers, white marked in the throat. It has violently emetic and purgative properties; but in small doses an infusion of the leaves is esteemed a valuable cathartic medicine, especially in the cure of painters' colic.

ALLAN, DAVID (1744–96). A Scottish genre and portrait painter. He was born at Alloa, studied in Glasgow and afterward at Rome under Gavin Hamilton. During a sojourn of 17 years in Rome he won the gold medal of the Academy of St. Luke and became a member of that body. In 1777 he settled at London as a portrait painter, and in 1780 he removed to Edinburgh, where he became the head of the Trustees' Academy in 1886. He now began to paint scenes from Scottish folk life, becoming a forerunner of Wilkie. Although interesting as illustrations, these paintings are totally deficient in technique. Allan was also an illustrator, his best-known work being illustrations of Allan Ramsay's *Gentle Shepherd* and of the *Poems* of his friend Robert Burns.

ALLAN, MAUD (1879—). An American classical dancer. She was born in Toronto, Canada, but when she was four years of age her family removed to San Francisco. She early manifested unusual musical talent, and after pursuing her studies abroad for several years she received from the Berlin Royal High School of Music the highest diploma for piano-playing. Afterward she decided to become a dancer and in 1902 made her first appearance before an invited audience at the Vienna Conservatory of Music. Her success led to public appearances in Brussels, Berlin, Budapest, Hamburg, and Paris. A far greater triumph than these was her appearance at the Palace Theatre in London in 1908 in "The Vision of Salome." In 1910 she appeared in New York.

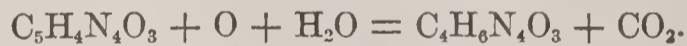
ALLAN, Sir HUGH (1810–82). A Canadian ship-owner. He went from Scotland to Canada as a clerk in 1826 and in 1835 became a ship-builder and commission merchant. During the Canadian rebellion of 1837–38, he served in the army as a volunteer and reached the rank of captain. He helped establish (1853), after many disasters, the Allan Line of screw steamships and was one of the projectors of the Canadian Pacific Railway and figured in the scandal connected with that road. Many transportation, manufacturing, and mining companies owed their success largely to his enterprise. He received the honor of knighthood in 1871, for his service to commerce. He was one of the wealthiest men in Canada.

ALLAN, Sir WILLIAM (1782–1850). A Scotch painter. He was born in Edinburgh and studied art in the Trustees' Academy there and in the schools of the Royal Academy, London. In 1805 he went to St. Petersburg, and spent several years in various parts of Russia and Turkey, where he acquired material for his first successful pictures. Returning to Scotland in 1814, he devoted himself to Scottish historical painting. This part of his work includes "John Knox Admonishing Queen Mary" (1823), and the "Death of the Regent Murray" (1825). In 1834 he returned to his earlier subjects, and his "Polish Exiles on their Way to Siberia" and

"The Moorish Love-Letter" won him a seat in the Royal Academy. Later pictures were "A Slave-Market in Constantinople" (1837), "The Battle of Prestonpans" (1842), "Waterloo," from both the French and English sides (1443–44), "Peter the Great teaching Shipbuilding to his Subjects" (ordered by the Czar, 1845). Allan became president of the Royal Scottish Academy in 1838, in 1841 succeeded Wilkie as limner to the Queen in Scotland, and was knighted in 1842. He was the intimate friend of Sir Walter Scott, whom he portrayed in his study (National Portrait Gallery, London). His work, very famous in his own day, is now considered lacking in originality and deficient in color. Consult the *Art Journal* (1849, 1850, 1903).

ALLANITE. A mineral silicate of the epidote group containing iron, calcium, aluminium, and the rare metals caesium, neodymium, praseodymium, lanthanum, and yttrium. It occurs in black or dark brown crystals with submetallic or resinous lustre and exhibiting strong pleochroism. It is found as an accessory mineral in many basic crystalline rocks and is frequently associated with masses of magnetic iron ore.

ALLANTOÏN (ultimately derived from *allantois*), $C_4H_6N_4O_3$. An organic substance found in the allantoic and amniotic fluids, in fetal urine, and in the urine of many animals during a short time after birth. It is a crystalline, solid substance, sparingly soluble in cold water, but dissolving readily in hot water or alcohol, and in solutions of alkaline carbonates. It may be obtained from the urine of calves by evaporating and letting stand, at ordinary temperatures, until the substance crystallizes out. Chemically, allantoin is the di-ureide of glyoxylic acid. It is one of the most important products of the oxidation of uric acid (allantoin is found in urine after uric acid has been taken internally), and, on the other hand, it may be readily made from urea by prolonged heating with glyoxylic acid. Allantoin may be best prepared by oxidizing uric acid with peroxide of lead, according to the following chemical equation:



The graphic formula of allantoin is



Allantoin was first discovered in 1790 by Vauquelin. See URIC ACID.

ALLANTOÏS (Gk. *állās*, *allas*, a sausage, and *ēidos*, *eidōs*, shape). A delicate membranous bag, which makes its appearance in the eggs of birds during incubation. Its function is chiefly the aëration of the blood of the embryo or chick. It sprouts from the lower part of the intestine of the chick, and rapidly enlarges, so as almost completely to inclose it, lining nearly the whole extent of the membrana putaminis—the double membrane which is immediately within the egg-shell. It is covered with a network of arteries and veins, corresponding to the umbilical artery and vein of mammalia; and the aëration of the blood is accomplished by the air which enters through the pores of the shell; but as the lungs become capable of their function, the circulation in the allantois diminishes, and its footstalk contracts and at last divides, leaving only a ligamentous

remnant. The allantois is never developed in the eggs of fishes and amphibians, hence these are called anallantoid vertebrates; while reptiles, birds, and mammalia, in which it is present, are called allantoid. In the mammalia it is superseded at an early period of foetal life by other contrivances, but continues to exist in the lower animals for receiving the urinary secretion through the urachus, a purpose which it serves in birds and reptiles likewise. In the human species it disappears very early, only a minute vesicle remaining. See EMBRYOLOGY.

ALLARD, á'lär', JEAN FRANÇOIS (1783-1839). Generalissimo of the army of Lahore, and previously Adjutant to Marshal Brune under Napoleon. After the murder of Marshal Brune (q.v.), Allard left France (1815), intending to emigrate to America, but changed his plan, went to Egypt, thence to Persia, to Kabul, and finally to Lahore (1820), where he engaged in the service of Ranjit Singh (q.v.), by whom he was made generalissimo. He married a native of Lahore, and identified himself with the interests of his adopted country, but he could not forget France, and the troops which he commanded were drilled under the French tricolor. The changed political situation after the revolution of 1830 brought him back to Paris (1836), where he was received with distinction and was made French chargé d'affaires in Lahore. He presented to the royal library of Paris a valuable collection of coins and returned to Lahore, leaving his wife and children in Paris. He distinguished himself in the Sikh campaigns against the Afghans and died at Peshawar, Jan. 23, 1839. His remains were, according to his own wish, buried with military honors at Lahore.

AL'LARGAN'DO. A term in music calling for a retardation of the tempo together with an increase in tonal volume. It is usually found in passages leading up to a climax, where the music assumes a character of broadness and majesty. Mere retardation of tempo, which usually goes parallel with decrease of tonal volume, is *rallentando* or *ritardando*.

ALLA'TIUS, LEO (1586-1669). A Greek ecclesiastic of the Roman Catholic church. He was born on the island of Chios, removed in 1600 to Rome, and studied at the Greek College there. He was appointed grand-vicar to the Bishop of Anglona, and was sent in 1622 by Gregory XV to bring to Rome the Palatinate, or Heidelberg, library. In 1661 he was appointed by Alexander VII librarian of the Vatican. He tried to reconcile the Western and Eastern churches, writing such treatises as *De Ecclesiæ Occidentalis atque Orientalis Perpetua Consensione* (1648) and *De Utriusque Ecclesiæ in Dogmate de Purgatorio Consensione* (1655). His further works include *De Libris Ecclesiasticis Græcorum* (1645) and *Græciæ Orthodoxæ Scriptores* (1652).

ALLEE VERTE, á'lá'vârt' (Fr. green walk). Once a fashionable promenade in Brussels (q.v.), now given over to business interests. It is lined with lime trees, crosses a canal in the city by means of a lofty bridge, and continues as the *Avenue de la Reine* to the church of St. Mary.

ALLEGAN, ä'lê-gan. A city and the county-seat of Allegan Co., Mich., 33 miles south of Grand Rapids, on the Lake Shore and Michigan Southern, the Pere Marquette, and the Michigan Central railroads, and on the Kalamazoo River (Map: Michigan, D 6). It contains a Carnegie library, a fine court house, a city hall, and a

hospital. The city is in a fertile agricultural and fruit-growing region and has valuable natural advantages in good water-power, derived by means of two dams, one in the city and the other on the river, 3 miles above. Power from the latter is transmitted for a considerable distance. The industrial establishments include paper, planing, and flour mills, furniture, casket, mirror, and picture-frame factories, carriage works, and a foundry and machine shop. Allegan was settled in 1835, was first incorporated in 1838, reincorporated in 1858 and again in 1907. The water works are owned and operated by the municipality. The business section of the city was destroyed by fire in 1884. Pop., 1900, 2667; 1910, 3419; 1913 (est.), 3500.

AL'LEGA'NY. A village in Cattaraugus Co., N. Y., 70 miles by rail southeast of Buffalo, on the Erie and the Pennsylvania railroads, and on the Allegheny River (Map: New York, B 6). The village is engaged in the oil industry and has a canning factory, five cheese factories, and saw mills. It is the seat of St. Bonaventure's College and Seminary, a Roman Catholic institution organized in 1859, and St. Elizabeth's Academy for Girls. Allegany was incorporated in 1905. Pop., 1910, 1286; 1913 (est.), 1300.

ALLEGATION. In common law pleading the assertion, declaration, or statement of fact made by a party to a suit upon which he relies to sustain his cause of action. As the term is limited to statements of fact, it does not include the declarations of legal right nor the remedy demanded in the pleading. In English ecclesiastical law, the entire plea of a party, comprehending all the statements of fact upon which he relies, is called his allegation. The term is also employed in a special sense in the phrase "allegation of faculties," to denote the statement of the property of the husband in a claim for alimony made by a wife in a suit for divorce in the ecclesiastical court. See PLEADING; DECLARATION; PLEA.

AL'LEGHA'NIES. A mountain range of Pennsylvania, Maryland, West Virginia, Virginia, and North Carolina, lying west of the Blue and Blue Ridge ranges, and having the same direction, northeast to southwest (Map: United States, Eastern Part, K 3). Rich mines of coal and iron have been so highly developed as to make the adjoining regions the greatest in the world in coal mining and in the manufacture of iron and steel products. The term "Alleghanies" is sometimes incorrectly extended to include the whole Appalachian system, of which it is a part. See APPALACHIANS.

AL'LEGHE'NY. An important manufacturing city in Allegheny Co., Pa., on the north banks of the Allegheny and Ohio rivers, now consolidated with the city of Pittsburgh under one municipal government and making up the "North Side" of that city. Connected with the central part of Pittsburgh by eight large bridges, affording ample facilities for communication, even before political consolidation, the two cities have always formed one industrial and social community. Allegheny is the terminus of the Western Pennsylvania, the Pittsburgh and Western, and the Buffalo, Rochester and Pittsburgh railroads; and is on the Pittsburgh, Fort Wayne and Chicago, the Cleveland and Pittsburgh, the Pittsburgh and Erie, and the Pittsburgh and Newcastle railroads, all of which belong to the Western division of the Pennsylvania system. Electric railways connect with

towns in the northern portion of Allegheny County and in Butler and Lawrence counties. It has also a large river traffic. This portion of the city of Pittsburgh covers about 12 square miles, and its topography is decidedly hilly: the hills in the northern part of the city rising to a height of 700 feet above the river or about 1300 feet above sea level. In the central part of the city is a park of over 100 acres, while in the northern part is located Riverview Park of over 150 acres. In the parks the Soldiers', the Washington, the Humboldt, the Anderson, and other monuments are interesting features. The more important benevolent institutions are the Allegheny General, the Presbyterian, and the St. John's hospitals, the colored Orphan Home, the Pittsburgh and Allegheny Orphan Home, the Home of the Friendless, the Gusky Orphanage, the United Presbyterian Children's Home, and the St. Joseph's Orphan Asylum. The Western (State) Penitentiary is also located here. Allegheny is the seat of the Western Theological Seminary of the Presbyterian church, of the Allegheny Seminary of the United Presbyterian church, and of the Reformed Presbyterian Seminary. The Allegheny Observatory (the Astronomical Department of the University of Pittsburgh) is situated on a high hill in the northern part of the city, and in the central part the Carnegie Free Library of over 100,000 volumes occupies a block. The library building is the first erected by Mr. Carnegie on his well-known principles of municipal support.

The most important industrial establishments are the extensive iron and steel rolling mills, and car and locomotive works; there are also large pickling and preserving plants, and many factories of white lead, sanitary plumbing supplies, salt, leather, stoves, and ranges.

Allegheny was laid out in 1788, and the lots were sold in Philadelphia by the State government in order to provide funds to redeem Revolutionary scrip. It was incorporated as a borough in 1828 and in 1840 as a city. On July 4, 1874, occurred a disastrous fire in which 199 buildings were consumed or badly damaged, and three weeks later a flood destroyed much property and caused 124 deaths. The city's growth since 1870 has been remarkable. Pop., 1870, 53,180; 1910, 132,283. The consolidation with the city of Pittsburgh was effected in 1907. Consult: Cushing, *History of Allegheny County* (Chicago, 1889); Lambing and White, *Allegheny County: Its Early History and Subsequent Development* (Pittsburgh, 1888).

ALLEGHENY COL'LEGE. A college at Meadville, Pa., founded in 1815 as a Presbyterian institution. The first president, Rev. Timothy Alden, D.D., secured for the college the support of many prominent men, among them John Adams and Thomas Jefferson. The gifts of the libraries of James Winthrop and William Bentley also attracted attention to the institution. In 1833 the college was transferred to the patronage of the Methodist church under an agreement that guaranteed a liberal and non-sectarian management. Courses are offered in the arts and sciences, but the main emphasis has always been put upon non-technical cultural subjects. The buildings and the grounds are valued at \$580,000. The more important of the buildings are Bentley Hall, the library (38,000 volumes), Cochran Hall, and Ford Memorial Chapel. The endowment amounts to \$750,000. In 1912-13 the faculty numbered 23 and there were 407

students, of whom 162 were women. President, William H. Crawford, D.D., LL.D.

ALLEGHENY RIVER. A river of Pennsylvania and New York, rising in Potter Co., Pa., nearly 2000 feet above the sea, and uniting with the Monongahela at Pittsburgh to form the Ohio (Map: Pennsylvania, B 2). Although flowing through a hilly region, it is navigable for small boats for nearly 200 miles above Pittsburgh, whence, via the Ohio and Mississippi, navigation extends to the Gulf of Mexico. It is about 325 miles long and drains an area of 11,000 square miles.

ALLE'GIANCE (Lat. *ad*, to + OF. and Eng. *liege*, but the formation was influenced by Lat. *alligare*, to bind to, and also by *lex*, law). "Allegiance," says Blackstone, "is the tie, or *ligamen*, which binds the subject to the sovereign, in return for that protection which the sovereign affords the subject." Allegiance is the highest legal duty of the subject, and consequently its violation, treason (q.v.), is the highest legal offense. Allegiance is of three kinds: (1) Natural or implied allegiance is that which every native or naturalized citizen owes to the State to which he belongs and whose protection he enjoys. Independently of any express promise, every man, by availing himself of the benefits which an organized political society affords, comes under an implied obligation to defend it, and this equally whether the attack be from without or from within. This conception of allegiance as a political obligation, involved in the notion of citizenship, is comparatively modern, and has gradually supplanted the feudal conception of allegiance as a duty voluntarily assumed as an incident of the feudal tenure of land. (2) Express allegiance is that obligation which arises from an express promise or oath of allegiance. The old English oath of allegiance corresponded in the case of the sovereign, as lord paramount of all the lands in England, to the oath of fealty, which, by the feudal law, all freehold tenants were required to take to their landlords. As administered for upward of 600 years, it contained a promise "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honor, and not to know or hear of any ill or damage intended him, without defending him therefrom."

With the substitution of the political for the feudal motive for allegiance and its consequent general obligation, the importance of the oath of allegiance has greatly diminished. It is commonly exacted of aliens acquiring naturalization, of persons lately in rebellion on resuming the status of citizens, and of public officers of all grades, and members of the bar. The form commonly employed in this country is a simple oath to support the Constitution of the United States and of the State of which the person taking the oath is a citizen. (See OATH.) (3) Local or temporary allegiance is that obedience and temporary aid due from an alien (q.v.) to the State or community in which he resides, by virtue of which he becomes subject to its laws, and liable for duty in the maintenance of social order.

It is but recently that the principal governments of Europe have come to recognize the right of persons voluntarily to change their allegiance as well as their residence, and such recognition is still grudging and imperfect. The United States has always held it to be a natural right, and our legislation so recognizes it. This

difference of view has sometimes brought our government into sharp diplomatic conflict with the States of Europe, especially in the effort to protect from military conscription former subjects of those States who had renounced their allegiance and become naturalized citizens of the United States. These efforts have generally proved successful, but the principle contended for by our government, though accepted (so far, at least, as the naturalization of their subjects in the United States is concerned) by England, France, Germany, and Austria-Hungary, is repudiated by Russia, Turkey, and some other States. This principle is plainly declared in the act of Congress relating to naturalization (q.v.), passed in July, 1868. The preamble states that the right of expatriation is natural and inherent in all people, and indispensable to the enjoyment of the rights to life, liberty, and the pursuit of happiness; that, recognizing this right, our government has received emigrants from all nations and given them citizenship and protection; that it is necessary for the maintenance of public peace that the claim of foreign allegiance as to such adopted citizens should be promptly and finally disavowed; and therefore it was enacted that any declaration, opinion, order, or decision of any officer of this government which denies, impairs, restricts, or questions the right of expatriation, is inconsistent with the fundamental principles of the government; that all naturalized citizens of the United States, while in foreign States, are entitled to, and shall receive from this government, the same protection of person and property that is accorded to native-born citizens in like circumstances. This broad declaration of rights and duties was followed in May, 1870, by the British Parliament in an act revising all British laws on alienage, expatriation, and naturalization—the government for the first time recognizing the right of subjects to renounce allegiance to the crown.

Allegiance of the population of a State or district is often transferred *en masse*, as an incident of territorial conquest or as the result of the cession of territory, as in the successive purchases of Louisiana from France, of Florida and the Philippine Islands from Spain, and of Alaska from Russia, as well as in the enforced cession to the United States of Texas and Porto Rico, and to Germany of Alsace-Lorraine as the result of successful war. The right of a State to claim the allegiance of the inhabitants of territory so acquired is undoubted, and it is only as a humane concession to the sentiment of loyalty of such a population that the right to choose between the old and the new allegiance is sometimes reserved by the treaty of cession. This permission has, in modern times, usually been granted, the inhabitants of the ceded territory being permitted to retain their nationality by withdrawing within a specified period from the ceded district.

In military usage allegiance is the oath demanded of officers and men to the sovereign or president, as supreme commander-in-chief of the army. In the German Empire the troops of Bavaria do not recognize the absolute control of the King of Prussia, except in time of war, when the full oath of allegiance and implicit obedience to the orders of the German Emperor is taken. Consult: Blackstone, *Commentaries on the Laws of England*, book i, chap. x; Pollock and Maitland, *History of English Law* (2d ed.,

Boston, 1899), vol. i, pp. 296–307, 458–467, vol. ii, pp. 502–511; Salmond, "Citizenship and Allegiance," in *Law Quarterly Review*, vol. xviii, Nos. 67, 69 (London, July, 1901, and January, 1902); Kent, *Commentaries on American Law*, vol. ii, section xxv. See also CITIZEN; SUBJECT.

ALLEGORY (Gk. ἀλληγορία, *allēgoria*, speaking otherwise, allegory, from ἄλλος, *allos*, other + ἀγορεύειν, *agoreuein*, to speak). The allegory as a literary manner is a narrative in which the incidents and the characters really refer to a complete and logical scheme of underlying thought. To be successful, the narrative must be not only interesting for itself, but also in perfect harmony with the veiled course of abstract reasoning. Such is Bunyan's *Pilgrim's Progress*, where, under the guise of a journey from the City of Destruction to the Celestial City, are portrayed the spiritual conflicts and the ultimate victory of the faithful Christian. Allegory, like other kindred figurative ways of speech, such as metaphor and personification, appears in all literatures. The Eastern people from the earliest times have been fond of it. Witness the beast fables which pass under the name of Pilpay, or Bidpai, where moral observations are enforced by tales about animals; also the comparison of Israel to a vine in the eightieth Psalm. The parables of Christ in the New Testament are essentially allegorical. (See PARABLE.) Though the Greeks had the allegorical habit earlier, the first definite mention of an allegory among them occurs in Plato's *Phædrus*. In this dialogue Socrates remarks on the tendency toward the rationalistic explanation of myths. This and other dialogues of Plato contain very beautiful allegories, among which may be cited the comparison of the soul to a charioteer drawn by two horses, one white and the other black. For Latin literature may be mentioned the story of Cupid and Psyche (which, though Greek in origin, survives only in the *Golden Ass* of Apuleius), Vergil's well-known description of Fame in the fourth book of the *Æneid*, and Ovid's splendid picture of the abode of that goddess in the twelfth book of the *Metamorphoses*. To a later time belongs Boëthius's *De Consolatione Philosophiæ* (sixth century A.D.), which was one of the widest-read books in the Middle Ages. The most flourishing period for the allegory in western Europe was from 1300 to 1600. In the long list of works are Dante's *Divine Comedy*, *The Romance of the Rose*, Langland's *Piers Plowman*, Chaucer's *House of Fame*, the writings of a whole school of Scotch poets, Hawes's *Pastime of Pleasure*, Barclay's *Ship of Fools*, Spenser's *Faerie Queene*, Swift's *Tale of a Tub*; and Addison's *Vision of Mirza*. Obvious allegory has now gone out of fashion, but we have in its place a vaguer symbolism, as in Tennyson's *Idylls of the King*.

The form of allegory thus defined and illustrated is often called moral or spiritual, to distinguish it from the historical allegory; i.e., the representation of historical characters under fictitious names. Thus, Lucifera in the *Faerie Queene* stands not only for pride, but also for Mary, Queen of Scots. The historical allegory became in the seventeenth century a favorite device of romancers, who described contemporary events in the terms of recent history. Of this style, an admirable example is Madame de Lafayette's *Princesse de Clèves*. Moreover, allegory is not confined to literature; it appears equally in painting and sometimes in sculpture.

Allegorical Interpretation. That kind of interpretation whereby the literal meaning of a passage or work is set aside for a more spiritual and profound import. St. Paul allegorizes when he interprets the history of the free-born Isaac and the slave-born Ishmael (Gal. iv. 24). At Alexandria, where met the Greek and the Jew, allegorical interpretation of the Old Testament was practiced as a critical method. Philo Judæus (20 B.C.), for example, applied the principles of Plato's philosophy to Hebrew theology. He was followed by many Christian theologians, the most famous of whom were Clement of Alexandria and Origen. The latter went so far as to say that "the Scriptures are of little use to those who understand them as they are written." As a specimen of his procedure may be taken his interpretation of the Mosaic account of the Garden of Eden. According to him, Paradise symbolized a high primeval spirituality; the Fall consisted in the loss of this state through spiritual and not material temptation; and the expulsion from the Garden lay in the soul's being driven out of its region of original purity. This allegorical method also gained foothold among the critics of Greek literature. Porphyry (died c.305), for example, explained the grotto of the nymphs in Homer's *Odyssey* (book xiii) as an allegory of the world. In a sense, the so-called "metaphysical interpretations" of Christian Science are allegorical. For a succinct account of the progress of allegory with special reference to English literature, consult W. J. Courthope, *A History of English Poetry* (London, 1895).

AL'LEGRET'TO. A musical term denoting a time faster than *andante* (q.v.) and slower than *allegro* (q.v.). However, much confusion has resulted from the fact that eminent composers of the last century were not agreed as to the exact character of the tempo. Even Beethoven uses the designation sometimes for fast, sometimes for slow movements. In both the Seventh and Eighth symphonies the *allegretto* movements are slow, equivalent to *andante* and *andante con moto* respectively, whereas in the famous sonata op. 27, No. 2 (Moonlight) the same term is used to denote the *scherzo* and is equivalent to a fast *allegro*. Modern composers generally employ the term in its correct signification.

ALLEGRI, ăl-lă'grê, ANTONIO. See CORREGGIO.

ALLEGRI, GREGORIO (1584-1652). An Italian composer. He was born in Rome, probably of the Correggio family. He studied under Nanini and was a friend of Palestrina. Appointed to the choir of the Sistine Chapel, Rome, by Urban VIII, he retained the position until his death. He was one of the earliest composers for stringed instruments. His most celebrated work, however, is the *Miserere*, for two choirs (of four and five parts), still annually rendered in the Sistine Chapel on Good Friday. Mozart, at the age of 14, performed the wonderful feat of writing the entire work from memory after having heard it but twice. Allegri is regarded as a link between the Roman and Neapolitan periods of Italian music.

ALLEGRO, ăl-lă'grô (It. from Lat. *alacer*, alacritous, lively). One of the five principal tempos (q.v.) in music, implying that the piece is to be performed in a quick or lively style. *Allegro*, like all the other degrees of movement, is often modified by other terms, such as *allegro non tanto*, *allegro ma non troppo*, *allegro mode-*

rato, *maestoso*, *giusto*, *commodo*, *vivace*, *assai*, *di molto*, *con brio*, etc. As a substantive, *allegro* is used as the name of a whole piece of music, or a movement, generally the first, of a symphony, sonata, or quartet.

ALLEINE, ăl'en, JOSEPH (1634-68). An English nonconformist divine, author of *An Alarm to the Unconverted*. He was born at Devizes, 86 miles west of London, was educated in Corpus Christi College, Oxford, and became a tutor there (1653). He was offered a political place, which he declined, but gladly took the office of assistant to George Newton, rector of the church of St. Mary Magdalene, Taunton (1654). About this time he married Theodosia, daughter of Richard Alleine. He was not only constant in religious work, but deeply learned in various sciences, and on intimate terms with the patriarchs of the Royal Society. When the persecution of nonconformists came, he and his senior pastor were ejected, and Alleine became an itinerant preacher of the Gospel wherever he could find opportunity. For this he was imprisoned, but released in May, 1664; yet in spite of the Conventicle Act or Five-mile Act, he pursued his work and was again imprisoned. His later years were full of persecution and suffering. No Puritan nonconformist name is more affectionately cherished than his. He died at Taunton, Nov. 17, 1668. For his life, consult Stanford (London, 1861).

AL'LEINE, or **ALLEIN**, RICHARD (1611-81). An English writer and theologian, author of *Vindiciæ Pietatis*, or *A Vindication of Godliness* (London, 1663). He was born at Ditchat, Somersetshire; educated at Oxford; became assistant in the ministry to his father, Richard Alleine, and was noted for his eloquence. He declared for the Puritans, but continued for 20 years (1641-62) rector of Batcombe in Somerset. On the passage of the Act of Uniformity he went with the ejected, and, after the Five-mile Act, preached where he could find occasion. His *Vindication of Godliness* was refused license, and Roger Norton, the King's printer, caused a large part of the first edition to be seized and sent to the royal kitchen for kindling; but, on reading it, he brought back the sheets and sold the work from his own shop, for which he had to beg pardon on his knees at the council table. Alleine died at Frome Selwood, Dec. 22, 1681.

ALLEMAINE, ăl-măn'. An old name for Germany (cf. Fr. *Allemagne*). See ALEMANNI.

ALLEMANDE, ăl'lê-mând' (Fr. feminine of *allemand*, German). A French dance, said to have been invented in the time of Louis XIV, which again became popular at the Parisian theatres during the reign of Napoleon I. It has the tempo of a slow waltz and consists of three steps (*pas marchés*) made in a sliding manner, backward and forward, but seldom waltzing or turning round. The whole charm of the dance lies in the graceful manner of entwining and detaching the arms in the different steps. In England it was called *Almain*, and is mentioned in Ben Jonson's play, *The Devil is an Ass*, acted in 1610, which proves it of earlier origin. The name has also reference to a German dance of Swabia, of which Beethoven's 12 *Deutsche Tänze* for orchestra are specimens. The *Allemande* is also the name of a movement in the *Suite* (q.v.), having no relation to the dance of the same name. It usually consists of a figurative melody which has a simple accompaniment.

AL'LEMAN'NI. See ALEMANNI.

ALLEN, ALEXANDER VIETS GRISWOLD, D.D. (1841-1908). A Protestant Episcopal theologian, born at Otis, Mass. He graduated at Kenyon College in 1862 and at Andover Theological Seminary in 1865. In 1867 he became professor of church history in the Episcopal Theological School at Cambridge, Mass. His publications include *Continuity of Christian Thought* (Boston, 1884; 11th ed., 1895), *Life of Jonathan Edwards* (1889), *Religious Progress* (1894), *Christian Institutions* (New York, 1897), *Life and Letters of Phillips Brooks* (2 vols., 1901). For his life consult C. Slattery (New York, 1911).

ALLEN, ANDREW HUSSEY (1855—). An American archivist and author, born in New York City. He graduated from Harvard in 1878, studied law, and was admitted to the bar, but never engaged in practice. From 1882 to 1885 he was disbursing agent of the court of commissioners of the Alabama claims. While serving in the United States Department of State as Chief of the Bureau of Rolls and Library from 1892 to 1905 he inaugurated (1893) the *Bulletin of Rolls and Library* as a medium for the publication of catalogues, indexes, and important papers of the national archives. This he edited to its conclusion in 1905. His published writings include: *Official Relations of the United States with the Hawaiian Islands from the First Appointment of a Consular Office there by the United States Government* (1893); *Method of Recognition of Foreign Governments and Foreign States by the Government of the United States*, (1897). He edited vols. i-iv of the *Documentary History of the Constitution of the United States* (1894-1905).

ALLEN, ARABELLA. A character in Dickens's *Pickwick Papers*. She becomes Mrs. Nathaniel Winkle.

ALLEN, CHARLES, LL.D. (1827-1913). An American jurist, born in Greenfield, Mass. He graduated from Harvard in 1847, studied law, and was admitted to the bar in 1850. For the next 12 years he practiced his profession in his native town. In 1861 he became Reporter of Decisions for the Supreme Judicial Court of Massachusetts, and soon after removed to Boston; from 1867 to 1872 he was Attorney-General of the State; and in 1881 was chairman of the commission to revise the statutes of Massachusetts. During his 16 years of service (1882-98) on the bench of the Supreme Judicial Court of the State, he became known as one of the most eminent jurists of his day. Among his legal writings are *Allen's Massachusetts Reports* (14 vols., 1861-69), and *Telegraph Cases* (1873). He also published *Notes on the Bacon-Shakespeare Question* (1900).

ALLEN, CHARLES GRANT BLAIRFINDIE (1848-99). An English author, better known as Grant Allen. He was born in Kingston, Canada, of Irish descent, and was educated at Merton College, Oxford, where he graduated in 1871. He then spent a few years as principal of a colonial college in Jamaica. He is best known by his popular scientific works, his expositions of the theory of evolution being particularly clear and readable. He spent most of his life in London, where he died. Among his scientific books are: *Physiological Æsthetics* (1877), probably his best work; *The Color Sense* (1879); *The Evolutionist at Large* (1881); *Vignettes from Nature* (1881); *Colin Clout's Calendar* (1883); *Flowers and their Pedigrees* (1884); *The Story of the Plants* (1895), and *Evolution of the Idea of God*

(1897). He also wrote a life of Charles Darwin (1885) and about 30 novels, among them: *Philistia* (1884); *The Devil's Die* (1888); *A Bride from the Desert* (1896); *The Woman Who Did* (1895), which excited much notice and comment when it appeared because of the author's bold treatment of the sex problem. Historical studies also attracted him, and he published *Anglo-Saxon Britain* (1881) and a series of historical guide books to Paris, Florence, and Belgium.

ALLEN, CHARLES HERBERT (1848—). An American politician and banker. He was born at Lowell, Mass., graduated in 1869 at Amherst College, and for a time was in the lumber industry at Lowell. In 1881-82 he served in the Lower House of the Massachusetts State Legislature and in 1883 in the State Senate. He was subsequently elected to the Forty-ninth and Fiftieth (1885-89) congresses. In 1898 he succeeded Theodore Roosevelt as Assistant Secretary of the Navy, and in 1900-01 was the first civil Governor of Porto Rico. In 1902 he retired from public life and became associated with banking and insurance interests in New York City. He was elected president of the American Sugar Refining Co. in 1913.

ALLEN, DAVID OLIVER (1800-63). An American missionary, born at Barre, Mass. He graduated in 1823 at Amherst College, studied at Andover Theological Seminary, and in 1827 went to Bombay as a missionary. He traveled widely in western India, established schools, directed a new translation of the Bible into Mahratta, and in 1853 returned, much broken in health, to America. His *History of India* was published at Boston in 1856.

ALLEN, EBENEZER (1743-1806). An American soldier. He was born in Northampton, Mass., and removed to Vermont in 1771. He became a Lieutenant in a company of Green Mountain Boys, was with Ethan Allen at Ticonderoga and with Colonel Warner in Canada, and during the Revolution served first as Captain in and then as Major of a battalion of New Hampshire rangers. He was conspicuous for gallantry at the battle of Bennington, and in September, 1777, forced the evacuation of Ticonderoga by his capture of Mount Defiance. For the next two years he commanded Fort Vergennes, part of this time serving also on the Board of War, and in 1780 he helped Governor Clinton of New York to intercept Sir John Johnson's raid from Canada. He was prominent in the planning of a new government for Vermont, helping to frame its constitution.

ALLEN, EDWARD PATRICK (1853—). A Roman Catholic bishop of Mobile, Ala., appointed in 1897. He was born at Lowell, Mass., and after completing a theological course at Mount St. Mary's College, Emmitsburg, Md., was ordained a priest in 1881. Afterward he held a professorship at Mount St. Mary's and was its president from 1884 until he was consecrated bishop by Cardinal Gibbons. During his administration he relieved the college of its heavy indebtedness, increased its equipment, and enlarged its faculty.

ALLEN, ELISHA HUNT (1804-83). An American diplomat and Hawaiian justice, born at New Salem, Mass. He graduated at Williams College, was called to the Massachusetts bar, and was a member of the State Legislature of Maine from 1836 to 1841 and in 1846. Between these periods he was a member of Congress. In 1849

he was elected to the Massachusetts Legislature and from 1852 to 1856 was United States Consul at Honolulu, Hawaii. In 1857-76 he was Chancellor and Chief Justice of the Hawaiian Islands and after that time was Minister of the Hawaiian Islands to the United States. He was dean of the diplomatic corps in Washington at the time of his death.

ALLEN, ELIZABETH CHASE AKERS (1832-1911). An American author, born at Strong, Me. Her verses, entitled "Rock Me to Sleep, Mother" (1859), became widely known and were frequently set to music. Mrs. Allen began to write under the pen-name Florence Percy. Among her works, which include both prose and poetry, are: *Poems* (1866-69); *Queen Catharine's Rose* (1885); *The Silver Bridge* (1885); *Two Saints* (1888); *The Proud Lady of Stavoren* (1897); *The Ballad of the Bronx* (1901), and *The Sunset Song* (1902). She was married first to Paul Akers (q.v.), the sculptor, who died in 1861, and second to E. M. Allen of New York.

ALLEN, ETHAN (1737-89). An American soldier. He was born at Litchfield, Conn., and about 1769 removed to Vermont, settling first at Bennington, where he became conspicuous in the contest between New Hampshire and New York for jurisdiction over the "New Hampshire Grants," now Vermont. He represented his fellow settlers in a suit at Albany in 1771, but, their claims being disregarded, he organized a force of Green Mountain Boys for the eviction of New York settlers. Governor Tryon, of New York, thereupon declared him an outlaw and offered £150 for his arrest. At the outbreak of the Revolution Allen and his associates offered their services to the patriot party and organized an expedition against Ticonderoga (q.v.). On the morning of May 10, 1775, he surprised the garrison and forced its commander to surrender "in the name of the great Jehovah and the Continental Congress." Allen soon afterward joined General Schuyler's army, was employed in secret missions to Canada, and rendered valuable aid in Montgomery's expedition. He was taken prisoner, Sept. 25, 1775, near Montreal, and was sent to England. Some months later he was sent back to this country and was kept as a prisoner in Halifax and New York until May 3, 1778, when he was exchanged. After his release he returned to Vermont, was brevetted Lieutenant-Colonel by the Continental Congress and became Brigadier-General of Vermont militia, though he devoted his attention chiefly to the old territorial dispute, and incidentally carried on a correspondence with Governor Haldimand of Canada, upon which a charge of treason was subsequently based. No satisfactory explanation has ever been given of his conduct, but the charge of treason is at least not fully substantiated. He moved to Burlington in 1787 and died there two years later. Though a blusterer, he was as full of action as he was of talk and had very great ability as a leader both in politics and in war. He wrote a *Narrative of Colonel Ethan Allen's Captivity* (1779), which went into numerous editions; a *Vindication of the Opposition of Vermont to the Government of New York* (1779), and *Reason the Only Oracle of Man, or A Compendious System of Natural Religion* (1784). Consult Henry Hall, *Ethan Allen* (New York, 1892), and Sparks, *Ethan Allen* (Boston, 1834).

ALLEN, FRED HOVEY (1845-). An American Congregational clergyman and author. Born

at Lyme, N. H., he graduated at the Hartford Theological Seminary, studied at Boston University and the universities of Berlin, Vienna, and Paris, and held pastorates in Boston, Wollaston, Abington, and Rockland. He founded and for some time edited the Lawrence (Mass.) *Eagle*, but is best known as the inventor of the first photogravure plates for art reproduction made in America. His writings include: *Masterpieces of Modern German Art* (1884); *Recent German Art* (1885); *Grand Modern Paintings* (1888).

ALLEN, FREDERIC DE FOREST (1844-97). An American classical scholar. He was born at Oberlin, Ohio, and graduated at Oberlin College in 1863. He was at Leipzig in 1868-70, and took his Ph.D. there with his thesis *De Dialecto Loerensium*, which is still an important monograph. Following his foreign study he was professor of foreign languages successively in the University of East Tennessee, the University of Cincinnati, and Yale College; for the last 17 years of his life he held the chair of classical philology at Harvard. In 1881-82 he was president of the American Philological Association, and in 1885-86 director of the American School of Classical Studies at Athens. In addition to numerous articles in classical journals he published an edition of the *Medea of Euripides* (4th ed., 1901); *Remnants of Early Latin* (1880); a revision of Hadley's *Greek Grammar* (2d ed., 1886); *Greek Versification in Inscriptions* (1888); *Æschylus: The Prometheus Bound and the Fragments of the Prometheus Unbound* (1897). His *Posthumous Papers* were published in the *Harvard Studies in Classical Philology*, vol. ix (Boston, 1898). In the same volume will be found a memoir of Mr. Allen, with a list of his books, by James Bradstreet Greenough.

ALLEN, GRANT. See ALLEN, CHARLES GRANT BLAIRFINDIE.

ALLEN, HARRISON (1841-97). An American physician and anatomist. He was born in Philadelphia and graduated in medicine at the University of Pennsylvania in 1861. In 1862 he became a surgeon in the United States army and served until the conclusion of the Civil War. In 1865 he was made professor of comparative anatomy and medical zoölogy at the University of Pennsylvania and was transferred in 1878 to the chair of physiology, which he occupied until 1895. Dr. Allen was professor of anatomy and surgery at the Philadelphia Dental College and surgeon to the Philadelphia Hospital. He was president of the American Laryngological Society in 1886 and of the American Anatomical Society from 1891 to 1893. In addition to many papers contributed to medical journals, he was the author of *Outlines of Comparative Anatomy and Medical Zoölogy* (1867), *Studies in the Facial Region* (1874), *An Analysis of the Life Form in Art* (1875), and *System of Human Anatomy* (1880).

ALLEN, HENRY (1748-84). An American religious enthusiast. He was born at Newport, R. I., but afterward settled in Nova Scotia, where he taught that the souls of all men are emanations from the same Spirit, that they were present with our first parents in Eden, that Adam and Eve in innocency were pure spirits without material bodies, that there will be no resurrection of the body, that men are not bound to obey the ordinances of the Gospel, and that the Scriptures are not to be interpreted literally, but in a spiritual sense. He published a volume of hymns and several treatises and sermons.

Though he made many converts to his religious ideas, the Allenites dwindled after his death.

ALLEN, HENRY WATKINS (1820-66). An American soldier and politician. He was born in Prince Edward Co., Va.; educated at Marion College, Mo.; taught school and practiced law in Mississippi. In 1842 he raised a company and served in the Texan war against Mexico. He was subsequently a member of the State Legislature of Mississippi and later of Louisiana. After studying law at Harvard and traveling in Europe, he entered the Confederate service in 1861 as Lieutenant-Colonel. He was wounded at Baton Rouge and at Shiloh, became a Brigadier-General in 1864, and in the same year was elected Governor of Louisiana, in which capacity he rendered valuable services to the Confederate government. After the war he removed to the City of Mexico, edited the *Mexican Times*, wrote *Travels of a Sugar Planter*, and assisted in the opening of trade between Texas and Mexico.

ALLEN, HORACE NEWTON (1858—). An American diplomatist and missionary. He was born in Delaware, Ohio, graduated in the Ohio Wesleyan University, studied medicine, and went as medical missionary (Presbyterian) to China. In 1884, at the time of the coup d'état of Kim Ok Kiun, he was at Seoul, Korea, and saved the life of a relative of Queen Ming. He was made court physician, and established a hospital under government control. When the first Korean legation went to Washington in 1888, he acted as interpreter and secretary. Returning to Korea in 1890, he soon became noted for his knowledge of Korean affairs and in 1901 was made United States Minister Plenipotentiary to the Korean Empire. Publications: *Korean Tales* (1889); *A Chronological Index of the Foreign Relations of Korea from the Beginning of the Christian Era to the Twentieth Century* (1900); *Supplement* (1903); *Korea: Fact and Fancy* (Seoul, 1904); *Things Korean* (Seoul, 1908).

ALLEN, HORATIO, LL.D. (1802-89). An American civil engineer. He was born at Schenectady, N. Y., graduated in 1823 at Columbia, and in 1826 was appointed resident engineer of the summit level of the Delaware and Hudson Canal, after serving for two years in a similar position on the Chesapeake and Ohio Canal. He was sent to England in 1828 to buy locomotives for the canal company's projected railway, made the acquaintance of George Stephenson, and in 1829, at Honesdale, Pa., the initial point of the railway, operated the "Stourbridge Lion" in the first trip made by a locomotive on this continent. From 1829 to 1834 he was the chief engineer of the South Carolina Railway, at that time the longest railway in the world (about 150 miles), and from 1838 to 1842 was principal assistant engineer of the Croton aqueduct for supplying water to New York City. He was at various times chief engineer and president of the Erie Railway, and consulting engineer for the Panama Railway and the Brooklyn Bridge. In 1842 he became connected with the New York Novelty Works, which furnished engines for nearly all the American and many foreign war vessels and steamships of the time. In 1872 and 1873 he was president of the American Society of Civil Engineers. He was the inventor of the so-called "swiveling truck" for railway cars. *The Railroad Era: First Five Years of its Development* (1884) was written by him. Consult M. N. Forney, *Memoir of Horatio Allen* (reprinted from the *Railroad and Engineering Journal*).

ALLEN, IRA (1751-1814). One of the founders of Vermont. He was born in Cornwall, Conn., and in 1772 removed to Vermont, where he served as a Lieutenant under his brother Ethan, and took an active part in the boundary dispute between New York and New Hampshire. As Lieutenant in Colonel Warner's regiment, and close associate of General Montgomery, he served in the Revolution. He was a member of the Vermont Legislature (1776-77) and of the State Constitutional Convention (1778) and in 1780-81 was a Commissioner to Congress. At various times he was a member of the Vermont Council; secretary and treasurer, and a member of the Board of War during the Revolution. The number of offices which he held finally provoked hostility. In 1789 he presented to the Legislature a memorial for the establishment of the University of Vermont, together with a subscription list of £5643, £4000 of which, plus a fifty-acre site at Burlington, he contributed. He was called the "Metternich of Vermont" and the "Father of the University of Vermont." He went to France in 1795 and bought 20,000 muskets and 24 cannon, intending to sell them to Vermont; but he was captured at sea and taken to England on a charge of furnishing arms to Irish rebels. He was acquitted after a lawsuit that lasted eight years. He published *The Natural and Political History of Vermont* (London, 1798; *Vermont Historical Society Collections*, 1870) and *Statements Appended to the Olive Branch* (1807); "Miscellaneous Remarks on the Proceedings of the State of New York vs. the State of Vermont," in *Vermont Historical Society Collections* (Montpelier, 1870).

ALLEN, JAMES LANE (1849—). An American novelist and writer of short stories, born at Lexington, Ky. He was educated privately and at Transylvania University, and subsequently taught for a time in the University of his native State. During early years of bitter poverty he had snatched leisure for some writing, but it was not until 1886 that he found himself sufficiently established as a contributor to magazines to be able to devote himself solely to literary work. He then took up his residence in New York. The background of his fiction is almost always Kentucky—for that State he has done what Thomas Nelson Page has done for Virginia and George W. Cable for Louisiana. Both in rendering incomparably the prodigal beauty of his homeland, and in portraying the vanished or vanishing social types of pioneer or ante-bellum days—Mr. Allen is a rare artist. But he is a psychologist and moralist as well; like Hawthorne, it is the problem of the human soul that most concerns him. His best work is included in the following list: *Flute and Violin* (1891); *The Blue Grass Region, and Other Sketches* (1892); *John Gray: a Novel* (1893); *The Kentucky Cardinal* (1895); *Aftermath* (1896); *A Summer in Arcady* (1896); *The Choir Invisible* (a rewriting of *John Gray*, 1897); *The Reign of Law* (1900); *The Mettle of the Pasture* (1903); *The Bride of the Mistletoe* (1909); *The Doctor's Christmas Eve* (1910); and *The Heroine in Bronze* (1912). Consult for biographical facts *Book News Monthly*, vol. xxiv, p. 753; for a consideration of Mr. Allen as an interpreter of Kentucky life, H. A. Toulmin, in *Social Historians* (Boston, 1911).

ALLEN, JEROME (1830-94). An American educator and author. He was born at Westminster, Vt., and graduated at Amherst College

in 1851. He presided over several educational institutions in the West from 1851 to 1885 and was professor of pedagogy at the University of New York from 1887 to 1893. To his efforts more than to any other agency was due the founding of the New York School of Pedagogy, of which he became dean in 1889. Professor Allen's publications include a *Handbook of Experimental Chemistry* (1876); *Short Studies in English* (1886-87); *Mind Studies for Young Teachers* (7th ed., 1887); and *Temperament in Education* (1890). For many years he edited Barnes's *Educational Monthly* and *School Journal*.

ALLEN, JOEL ASAPH (1838—). An American naturalist. He was born at Springfield, Mass., July 19, 1838. Between 1865 and 1869, and again in 1873, he took part in various scientific expeditions to Brazil and Florida and to the Rocky Mountains, gathering material and contributing studies of it to scientific periodicals, especially the *Proceedings of the Boston Society of Natural History*. In 1870 he became an assistant in the Museum of Comparative Zoölogy at Harvard University and later its curator of birds and mammals. In 1886 he was appointed to a similar office in the American Museum of Natural History in New York. He was one of the founders and early presidents of the American Ornithologists' Union and the editor of its quarterly publication, *The Auk*, from 1884 to 1912. He was one of the early members of the National Academy. Dr. Allen won rank as one of the foremost systemists of American mammals and birds, in which work he made minute subdivisions. He also made fruitful researches into the principles of geographical distribution, and those governing climatic and seasonal variation in color, size, and other details. In addition to a great number of scientific papers, he is author of *Mammals and Winter Birds of Eastern Florida* (1871); *The American Bisons* (1876); *Monographs of North American Rodentia* (with E. Coues, 1877); *History of North American Pinnipedia* (1880); *Mammals of Patagonia* (1905); *The Influence of Physical Conditions in the Genesis of Species* (1905), and *Ontogenetic and Other Variations in Musk-Oxen* (1913).

ALLEN, JOSEPH HENRY (1820-98). A Unitarian scholar. He was born at Northborough, Mass., Aug. 21, 1820; graduated at Harvard College, 1840, and at the Divinity School in 1843. He was pastor at different places; editor of *The Christian Examiner*, 1857-69; lecturer upon ecclesiastical history in Harvard University, 1878-82; joint editor (with J. B. Greenough) of a series of classical text-books; author of *Hebrew Men and Times* [to the Christian era] (Boston, 1861); *Christian History in its Three Great Periods: (1) Early Christianity, (2) The Middle Age, (3) Modern Phases* (3 vols., 1882-83); *Our Liberal Movement in Theology, chiefly as Shown in Recollections of the History of Unitarianism in New England* (1882); *Historical Sketch of the Unitarian Movement since the Reformation* (New York, 1894). His works show independent study and acquaintance with sources, and his denominational histories rest upon personal acquaintance with leaders. He died in Cambridge, Mass., March 29, 1898.

ALLEN, KARL FERDINAND (1811-71). A Danish historian, born at Copenhagen. He studied at the university there, and in 1845 to

1848 made examinations of various European archives. He was appointed an instructor and titular professor at Copenhagen in 1851 and professor of history and northern archæology in 1862. His principal work is his *De Tre Nordiske Rigers Historie, 1497-1536* ('The History of the Three Northern Kingdoms,' 5 vols., 1864-72), one of the most important contributions to the history of northern Europe.

ALLEN, RICHARD (1760-1831). A colored Methodist preacher. He was born in slavery, but bought his freedom and afterward acquired considerable wealth. He became a local Methodist preacher in 1782 and organized the first church for colored people in the United States, in Philadelphia, in 1793. He was the first colored minister ordained by Bishop Asbury (1799), and was elected a bishop of the African Methodist Episcopal Church on its formation in 1816. He died in Philadelphia.

ALLEN, ROBERT (1815-86). An American soldier. He was born in Ohio, graduated at West Point in 1836, served with distinction in the second Seminole War and in the Mexican War, and was subsequently Chief Quartermaster of the Pacific Division until 1861, when he became Quartermaster of the Department of Missouri. In this capacity, and afterward (1863-66), as Chief Quartermaster of the Missouri Valley, he rendered valuable services to the Federal armies in the West, and by successive promotions became Brevet Major-General in 1865. After the war he was again Chief Quartermaster of the Pacific Division until retired in 1878.

ALLEN, THOMAS (1849—). An American landscape and animal painter. He was born at St. Louis, Mo., studied long at the Düsseldorf Academy and with Ecoen in Paris. After a sojourn of 10 years abroad, he opened a studio in Boston. He became a member of the Society of American Artists (1880) and an associate member of the National Academy of Design (1884) and was one of the international board of judges at the Chicago Exposition in 1893 and president of the International Jury at St. Louis in 1909. In 1910 he became chairman of the Art Commission of the City of Boston. His most successful works are landscape and animal subjects, and include "O'er All the Hilltops is Rest," "Maplehurst at Noon," and "Toilers of the Plain." Although he keeps pace with modern technical achievements, Allen, in his reserved and harmonious art, represents conservative tendencies in American painting.

ALLEN, VIOLA (1869—). An American actress, born in Alabama, Oct. 27, 1869, daughter of C. Leslie Allen, an actor of great repute. She appeared on the stage when 15 years old, in *Esmeralda*, at the Madison Square Theatre, New York (1882), and later played in the company of John McCullough and with Tommaso Salvini, Lawrence Barrett, Joseph Jefferson, and W. J. Florence. In 1893 she joined the Empire Stock Company and appeared in *The Masqueraders* and *Under the Red Robe*. In 1898 she made a wide reputation in Hall Caine's dramatized novel *The Christian* and subsequently starred in *In the Palace of the King* (1900), by F. Marion Crawford and Lorimer Stoddard, *Twelfth Night*, *A Winter's Tale*, *As You Like It*, *The Lady of Coventry* (1911), etc. Consult L. C. Strang, *Famous Actresses of the Day in America* (Boston, 1899), and J. B. Clapp and E. F. Edgett, *Players of the Present* (New York, 1899).

ALLEN, WILLIAM (1532-94). An English Cardinal. Born at Rossall, he studied in Oriel College, Oxford, and became principal of St. Mary's Hall in 1556. He opposed the Reformation and after Elizabeth's accession he went to Louvain (1561). He returned to England (1562), but his proselytizing zeal made another flight necessary, and he went to Holland (1565) and never revisited England. He was ordained priest at Mechlin, was more prominent in organizing in the University of Douai (1568), a college for English Roman Catholics, whence he sent Jesuit priests to his native land, the aim of his life being to restore papal supremacy in England. In 1570 he became regius professor of divinity, in 1587 a Cardinal; in 1589 he was offered the archbishopric of Malines, but declined the honor. He died at Rome, Oct. 16, 1594. He made vigorous efforts to check the progress of the Protestant Reformation in England and engaged in polemical writing. Several violent libels of the time are attributed to his pen, but his authorship of these has been disputed. Among the Jesuit priests he sent to England was the celebrated Father Campion, put to death by Elizabeth. He published 10 volumes, among them *Certain Brief Reasons Concerning Catholic Faith* (1564), and aided in revising the English translation of the Bible known as the Douai Bible. Consult his *Letters and Memorials*, with introduction by T. F. Knox (London, 1882).

ALLEN, WILLIAM (1770-1843). An English philanthropist. He was lecturer on chemistry in Guy's Hospital, fellow of the Royal Society, and one of the founders of the Pharmaceutical Society. Jointly with Samuel Pepys he established the chemical composition of carbonic acid. He belonged to Sir Humphry Davy's circle of friends, and at his request he lectured on physics at the Royal Institution. He was a prominent member of the Society of Friends and bore an active part in the philanthropic movements of his time. Wilberforce and Clarkson were his intimate friends, and he shared in the anti-slavery agitation. He was an active supporter of Lancaster and Bell in their educational movement, championing their side of the controversy in his journal, *The Philanthropist* (1811-17); and he was associated with Robert Owen in his schemes for social improvement. He also founded industrial schools and advocated the abolition of capital punishment. He contributed papers to the *Philosophical Transactions*. Consult *Life of William Allen, with Selections from His Correspondence* (2 vols., Phila., 1847).

ALLEN, WILLIAM (1784-1868). An American educator and author. He was born at Pittsfield, Mass.; graduated at Harvard in 1802, and after a few years spent in pastoral work became assistant librarian at Harvard. There he prepared his *American Biographical and Historical Dictionary* (1809), the first work of general biography published in the United States. The third edition (1857) has notices of nearly 7000 Americans, while the first has only 700. He contributed to a new edition of Webster's Dictionary 10,000 words not before given. In 1810 he became his father's successor in the pulpit in Pittsfield. In 1817 he was elected president of Dartmouth College, and from 1820 to 1839 (with a short interim) he was president of Bowdoin College. Allen's memoir was published in 1847.

ALLEN, WILLIAM (1806-79). An American

statesman. He was born in North Carolina, but at an early age went to Ohio, where he practiced law. He was elected to Congress in 1832 by the Democrats, but was defeated on a second trial. He was twice elected to the United States Senate and served from 1837 to 1849. In 1848 he was offered the nomination for President, but declined it on the ground that he was pledged to Gen. Lewis Cass. In 1873 he was elected Governor of Ohio. Two years afterward he was a candidate for reelection, but as he made his canvass on the greenback issue, of which cause he had become the foremost advocate, he was defeated by R. B. Hayes. He is said to be the author of the famous alliterative slogan of the campaign of 1844, "Fifty-four forty, or fight," and while in the Senate, because of speeches he made, was variously known as "Earthquake Allen," "Petticoat Allen," and "The Ohio Gong." Consult Howard Carroll, *Twelve Americans* (1883).

ALLEN, WILLIAM FRANCIS (1830-89). An American educator and historian, joint editor of Allen and Greenough's series of school books. He was born at Northborough, Mass., and graduated at Harvard in 1851. He studied history and antiquities in Germany and Italy for two years and afterward became professor of Latin and Roman history at the University of Wisconsin, where he held a chair from 1867 until his death. In addition to his text-books, he published many works of standard merit, including *Outline Studies in the History of Ireland* (1887). A memorial volume of his *Essays and Monographs* was published in 1890, containing a sketch of his life.

ALLEN, WILLIAM HENRY (1784-1813). An American naval officer. He was born in Providence, R. I., and entered the navy in 1800. In 1807 he was Third Lieutenant of the *Chesapeake* when she was captured by the *Leopard*, and was a Lieutenant on the frigate *United States* in the action with the *Macedonian*, Oct. 25, 1812, in which the latter was captured. Afterward he commanded the brig *Argus*, cruising off England in 1813. After having captured \$2,000,000 worth of property, he encountered the British brig *Pelican*, August 14, and lost his own vessel, dying the next day of wounds received in the fight.

ALLEN, WILLIAM HENRY, LL.D. (1808-82). An American educator. He was born at Manchester, Me., and graduated at Bowdoin College in 1833. He was instructor in Latin and Greek at Cazenovia (N. Y.) Seminary from 1833 to 1836; professor of natural philosophy and chemistry in Dickinson College, 1836-46; of philosophy and English literature there from 1846 to 1849, acting as president for two years; president of Girard College, Philadelphia, 1850-62 and 1867-82. Between his two terms at Girard he served as president of the Pennsylvania State Agricultural College. In 1872 he was chosen president of the American Bible Society. He was the author of a number of interesting pamphlets and reports on educational subjects.

ALLEN, ZACHARIAH (1795-1882). An American scientist and inventor. He was born in Providence, R. I., graduated at Brown University in 1813, studied law in the office of James Burrill, and was admitted to the bar in 1815. Subsequently he became a manufacturer, and in 1825 visited Europe for the study of mechanical methods in England, Holland, and France.

He constructed (1821) the first hot-air furnace for the heating of dwelling houses, was the first to calculate the motive power of Niagara Falls (*Silliman's Journal*, April, 1844), devised the system of mutual insurance of mill property, and framed new laws for regulating the sale of explosive oils. In 1833 he patented his best-known invention, the automatic cut-off valve for steam engines, still in use with improvements. He was from 1822 a member, and from 1880 president, of the Rhode Island Historical Society. His publications include: *The Science of Mechanics* (1829); *Philosophy of the Mechanics of Nature* (1851); *The Rhode Island System of Treatment of the Indians, and of Establishing Civil and Religious Liberty* (1876); address at the bi-centennial anniversary of the burning of Providence; and *Solar Light and Heat, the Source and Supply* (1879). Consult Perry, *Memorial of Zachariah Allen, 1795-1882* (Cambridge, 1883).

ALLEN-A-DALE. See ALAN-A-DALE.

ALLENDE. A city in Mexico. See SAN MIGUEL DE ALLENDE.

AL'LENITES. See ALLEN, HENRY.

ALLENSTEIN, ä'l'ën-stîn. A town of East Prussia, capital of the circle of Allenstein, situated about 32 miles from the Russian frontier, on the river Alle (Map: Prussia, J 2). It is a well-built and neat-looking town, with an old castle, a monument to Kaiser Wilhelm I, several churches, a gymnasium, and an agricultural school, a hospital, gas works, and a number of markets. Its industrial establishments include iron foundries, machine shops, and it manufactures barrels, stoves, and matches. Pop., 1900, 24,307; 1905, 27,422; 1910, 33,070.

ALLEN'TIAC. A now extinct South American linguistic stock. At the time of the Spanish conquest the Allentiacs, or Huarpes (Guarpes), inhabited the plains about the great lagunes of Huanacache, in Argentina. They are said to have been a rather savage people and unrelated to the tribes of the Andean valleys. See Chamberlain, in the *American Anthropologist*, vol. xiv, n. s., pp. 499-500 (1912), and Cojazzi, *Gli Indii dell' Arcipelago Fueghino* (Turin, 1911).

ALLENTOWN. A city and the county-seat of Lehigh Co., Pa., 50 miles (direct) northwest of Philadelphia, on the Lehigh River, the Lehigh Canal, and on the Lehigh Valley, the Central of New Jersey, the Perkiomen, and Philadelphia and Reading railroads (Map: Pennsylvania, K 6). The city is one of the largest producers of furniture in the United States, is second in the production of American silks, and has extensive manufactures of iron and steel, cement, shoes, hosiery, underwear, wire, auto fire engines, cigars, thread, etc. The original Portland cement fields are only 10 miles distant. The city is the seat of Muhlenberg College (Lutheran), established 1867, and of the Allentown College for Women, and has an Elks' Home, a library, a hospital, and many churches, in one of which the Liberty Bell was hidden when removed from Philadelphia to prevent its capture by the British. Allentown was laid out about 1752 by William Allen, then Chief Justice of Pennsylvania, and was known by its present name until, in 1811, it became the seat of justice of Lehigh County, and was incorporated as the borough of Northampton. In 1838 its original name was restored, and in 1867 Allentown was incorporated by a special

charter. It adopted the commission form of government in 1913. The water works are owned and operated by the municipality. Pop., 1890, 25,228; 1900, 35,416; 1910, 51,913. Consult Matthews and Hungerford, *History of the Counties of Lehigh and Carbon* (Philadelphia, 1884).

ALLEP'PI, à-lëp'è, or **ALLAPPALI,** à-läp'-à-lë. A seaport on the west coast of the native State of Travancore, in the southern part of Madras, British India (Map: India, C 7). It has a sheltered roadstead and carries on a considerable export trade in coffee, pepper, and cardamoms. Canals and lagoons along the coast facilitate trade with Cochin on the north and Trivandrum on the south. Pop., 1901, 24,918.

ALLER, ä'l'ër. A river of Germany, rising about 20 miles west of Magdeburg. It flows northwestward, joining the Weser near Verden. Of its course of 155 miles, the greater part across Hanover, the portion which lies below Calle is navigable.

AL'LERTON, ISAAC (c.1583-1659). One of the Pilgrim Fathers who came to America in the first voyage of the *Mayflower*. He was one of the energetic and wealthy members of Plymouth Colony and was sent to Europe several times as its agent. A disagreement with the colony in 1631 resulted in his removal to New Amsterdam, where he became a member of the Council in 1643. He spent the latter years of his life in New Haven. His daughter, Mary, was the last survivor of the *Mayflower* company.

ALLESTREE, or **ALLESTRY,** RICHARD (1619-81). An English divine and educator, born at Uppington in Shropshire. After graduating from Oxford he took arms for the King in 1642. He remained an active Royalist throughout the Commonwealth and at the Restoration became canon of Christ's Church and lecturer at Oxford and, in 1663, the King's chaplain and regius professor of divinity at Oxford. His works include several volumes of sermons.

ALLEVARD-LES-BAINS, ä'l'vâr'lâ-bän'. A town of the department of Isère, France, on the left bank of the Breda, 15 miles southeast of Chambéry. It has iron and steel manufactures and is a popular resort because of valuable medicinal springs and the picturesque scenery of its valley. Pop., 1901, 2546; 1911, 2715.

ALLEYN, ä'l'en, EDWARD (1566-1626). An English actor, theatre manager, and the founder of Dulwich College. Born in the parish of St. Botolph, just out of London, he went upon the stage shortly before Shakespeare came from Stratford. Alleyn won rapid success, especially in tragedy, playing among other rôles the Jew in Marlowe's *Jew of Malta*, and also Tamburlaine and Faustus. He owned several playhouses and in 1592 married the step-daughter of Philip Henslowe (q.v.), with whom he was associated in building the Fortune Theatre and in various other enterprises, including the profitable business of bear-baiting. As his wealth increased, he ceased acting and became a manager. His chief claim to remembrance is as the munificent founder of the College of God's Gift, at Dulwich. His motive in this benefaction has been ascribed by tradition to an apparition of the devil, who appeared to him as he was playing that character in a theatre, but his well-known liberality and the fact that he was childless are more to the point. The college was begun in 1613, and in 1619, after some obstruc-

tion on the part of Lord Chancellor Bacon, who wished the King to prefer the foundation of two lectureships at Oxford and Cambridge, it obtained the royal charter. Here for several years Alleyn resided and managed the affairs of the institution. Alleyn was a friend of Shakespeare and Ben Jonson and a patron of Dekker (q.v.) and other writers. He was buried in the chapel of the college he had founded, and among its possessions are his portrait and a collection of his business papers. Consult: J. P. Collier, *Memoirs of Edward Alleyn* (London, 1841); J. P. Collier, *Annals of the Stage* (London, 1819); Warner, *Catalogue of the Manuscripts and Muniments at Dulwich College* (London, 1881); Thomas Fuller, *Worthies of England* (London, 1662).

ALLEYNE, ăl'in, ELLEN. A pseudonym under which Christina G. Rossetti wrote for *The Germ*.

ALL FOR LOVE, OR THE WORLD WELL LOST. One of Dryden's best-known tragedies, produced in 1678. It is unrhymed, and in some respects is an imitation of Shakespeare's *Antony and Cleopatra*.

ALLGAU, äl'goi. A subdivision of the European Alps (q.v.) in its widest sense, surrounding the basin of the Iller River in southwestern Bavaria. The name is also applied to the Bavarian districts of Sonthofen and Immenstadt.

ALLGEMEINE ZEITUNG, äl'ge-mī'ne tsī'tung (Ger. 'general newspaper'). The first German newspaper of a high class. It succeeded in 1798 the *Neueste Weltkunde* and was published by Cotta (q.v.), who had sought Schiller as editor. The journal became the organ of statesmen and publicists and has always commanded the services of distinguished literary men as critics and correspondents. First published at Stuttgart, it was successively transferred to Ulm and Augsburg and is now published at Munich.

ALL HAL'LOWS, COLLEGE OF. A college in Dublin, Ireland, for the training of Roman Catholic missionaries. It derives its name from its situation on grounds which once belonged to the monastery of All Hallows, suppressed by Henry VIII. It was founded in 1842 by Father Hand. One year after its foundation the college had 38 students. Over 500 of its graduate priests are to be found in English-speaking countries, and many of these are active among the Irish Catholics in the United States. Among its professors were Dr. Woodlock, Dr. Moriarty, the Rev. Thomas Potter, and Henry Bedford.

AL'LIÄ. In ancient geography, a small stream which flowed into the Tiber about 11 miles north of Rome. It is celebrated as the scene of the defeat of the Roman army by the Gauls, under Brennus, about 390 B.C. Immediately afterward, Rome was taken, plundered, and burned. It is difficult to identify the Allia with any of the modern streams; but the evidence seems in favor of the Fosso della Bettina.

AL'LIÄ'CEOUS PLANTS. Plants of the genus *Allium* (q.v.), belonging to the Liliaceæ. The term is generally employed to denote not only the possession of certain botanical characters, but also of a certain smell and taste, well known by the term "alliaceous," of which examples are readily found in the onion, leek, garlic, and other familiar species of *Allium*, much employed for culinary purposes. These plants contain free phosphoric acid and a sulphuretted oil, which is partly dissipated in

boiling or roasting. The alliaceous flavor is, however, found also, although in comparatively rare instances, in plants of entirely different botanical affinities.

ALLI'ANCE. A city and the county-seat of Box Butte Co., Neb., 360 miles west by north of Lincoln, on the Chicago, Burlington, and Quincy Railroad (Map: Nebraska, B 1). It has important stock-raising interests and manufactures butter. It has municipal water works and lighting system. Pop., in 1890, 829; in 1900, 2535; 1910, 3105; 1913 (est.), 4000.

ALLIANCE. A city in Stark Co., Ohio, 50 miles (direct) south-southeast of Cleveland, on the Mahoning River, and at the junction of the Cleveland and Pittsburgh, the Pittsburgh, Youngstown, and Ashtabula, the Lake Shore and Michigan Southern, and the Pittsburgh, Fort Wayne, and Chicago railroads (Map: Ohio, H 4). It is a large railroad centre and has interurban lines running in all directions. Mount Union Scio College (Methodist Episcopal) is located here. Alliance has a large steel plant, and among its extensive manufactures are gun carriages, traveling cranes, boilers, drop forgings, account registers, and automobile parts. It has large railroad shops. Alliance was settled in 1838 as Freedom, but in 1854 was incorporated under its present name. The government is administered under the provisions of the Ohio Municipal Code of 1902. The mayor is chosen biennially, and there is a city council of seven members. The water works are owned by the city. Pop., 1900, 8974; 1910, 15,083; 1913 (est.), 18,000.

ALLIANCE ISRAELITE UNIVERSELLE, äl'yäns' ès'rá'ä'lét' ü'ně'vâr'sěl'. An association founded at Paris in 1860 by six Frenchmen (Astruc, Isidore Cohen, Jules Carvalho, Narcisse Leven, Eugene Manuel, and Charles Netter) for the amelioration of the condition of the Jews throughout the world. The original members of the society were Jews, and by far the largest number of its members at present belong to that faith. The organization is unique in that it is a universal educator of Jews and Gentiles alike; hence it has enjoyed at all times the sympathy and coöperation of many prominent Christians. As outlined in its prospectus, the programme of the society included the emancipation of the Jews from oppressive and discriminating laws, political disabilities, and the defense of them in those countries where they were subjected to persecution. For the attainment of this object the founders of the society purposed to carry on a campaign of education through the press and by the publication of works on the history and life of the Jews. In the beginning, however, the course of action adopted by the society for bringing relief to their oppressed brethren in other countries was to secure the intercession of friendly governments in their behalf. Thus, as early as 1867 the governments of France, Italy, Belgium, and Holland made the renewal of existing treaties with Switzerland conditional upon that country's granting full civil and political rights to the Jews. In 1878 representatives of the Alliance laid the condition of the Jews in the Balkan Peninsula before the Congress of Berlin, as a result of which the Treaty of Berlin stipulated that in Rumania, Servia, and Bulgaria no discrimination should be made against any religion in the distribution of civil rights. Of late years the activity of the Alli-

ance has tended to become more educational than political, and the chief problem with which it was occupied at the beginning of the twentieth century was the improvement of the condition of the Jews in the Orient. Schools have been established in Bulgaria, European and Asiatic Turkey, Persia, Tunis, Morocco, and elsewhere. In 1913 the number of such schools was about 150, with a teaching staff of over 700 and an attendance of 45,000. Instruction is carried on in the language of the country or in the dialect employed by the majority of pupils, and instruction, as well as school supplies and lunches, is free to the poorest pupils. In addition to the cultural schools, many manual training workshops have been established for boys and schools of domestic science for girls, the encouragement of handicrafts among the Jews being one of the chief educational aims of the Alliance. Linguistic and vocational training are encouraged in every Alliance school, while the preparation for good citizenship is never neglected. Two farm-schools have been established—one near Jaffa in Palestine, the other at Djedeida, near Tunis; the former of these has supplied the Jewish colonies in Palestine with skilled agriculturists and supervisors. At Paris there is a normal school for the education of teachers who are exclusively drawn from the schools of the Alliance and are sent back after a thorough training to carry on in their turn the work of instruction in their native countries. The central committee of the Alliance, with its seat at Paris, consists of both resident and non-resident members, the latter being scattered all over the world, five of them residing in the United States. The central committee stands in constant communication with the regional and local committees, of which there are a number in the United States, the principal ones being at New York and Philadelphia. The Alliance publishes monthly bulletins and a semi-annual report in French and German, and at intervals issues reports in English, Hebrew, Hungarian, and Judeo-Spanish. In 1910 the Alliance, with the coöperation of the French consular authorities, secured important concessions in Fez. Indeed, in Persia, Morocco, Russia, Turkey, and elsewhere, the good offices of the Alliance, discreetly and persistently rendered, have done much to better the laws under which Jews live. In 1910 the fiftieth anniversary of the Alliance was universally celebrated. Both European and Eastern political history have been influenced by its activities. For a full account of it, consult N. Leven, "L'Alliance Israélite Universelle" in *Cinquante Israélite Universelle*, vol. i (Paris, 1911). Current news of its activities will be found in *Ost und West*, the German organ of the Alliance Israélite Universelle.

ALLIANCE OF THE REFORMED CHURCHES HOLDING THE PRESBYTERIAN SYSTEM. An alliance formed in London in 1875. It holds councils, which have no legislative authority but great moral weight. In them the various Augustinian non-prelatical and Presbyterian or Reformed national and denominational churches find representation. There are over 90 of these churches, with over 5,000,000 members and 25,000,000 adherents, throughout the world. In the intervals between councils the business of the Alliance is conducted by an executive commission. The councils have been held at London, 1875; Edinburgh, 1877; Philadelphia, 1880; Belfast, 1884; London, 1888; Toronto,

1892; Glasgow, 1896; Washington, 1899; Liverpool, 1904.

AL'LIA'RIA. The old name of a genus of plants belonging to the family Cruciferae, but now included in the genus *Sisymbrium*. It is known by the popular names of sauce-alone and jack-by-the-hedge. The best known species, *Sisymbrium alliaria* (*Alliaria officinalis*), called garlic-mustard, is a native of Great Britain, not unfrequently found on hedge-banks and in waste places in dry, rich soils, and is common in most parts of Europe. It has also become introduced in a number of places in the United States. It is a biennial, with a stem 2 to 3 feet high; large, stalked, heart-shaped leaves, white flowers, and pods much longer than their stalks, which are somewhat spreading. It seems more deserving of cultivation than many other plants which have long received the constant care of the gardener, being wholesome, nutritious, and to most persons pleasant. The powdered seeds were formerly employed as a sternutatory.

AL'LIBONE, SAMUEL AUSTIN (1816-89). An American author. He was born at Philadelphia, and although engaged in commercial pursuits, devoted considerable time to literature. It was therefore as an amateur that he began the literary work to which the best part of his life was devoted. This work, the *Critical Dictionary of English Literature and British and American Authors*, contains notices of 46,599 writers. The first volume appeared in 1854. In 1891 a three-volume supplement to this work, with 37,000 authors' names and 93,000 titles, appeared. Allibone was book editor and corresponding secretary of the American Sunday-school Union from 1867 to 1873 and from 1877 to 1879. In 1879 he was appointed librarian of the Lenox Library in New York and held this position until 1888. He died at Lucerne, Switzerland, Sept. 2, 1889. Besides the *Critical Dictionary*, he compiled the following works: *Poetical Quotations from Chaucer to Tennyson*, containing 13,600 passages, taken from 550 authors (1878; 1901); *Prose Quotations, from Socrates to Macaulay*, with indexes to the 8810 quotations, containing the names of 544 authors and 571 subjects (1876); *Explanatory Questions on the Gospels and the Acts* (1869); *An Alphabetical Index to the New Testament* (1868); *Indexes to Edward Everett's Orations and Speeches* (1850-59); *Great Authors*, an anthology (1885). New editions of his *Poetical Quotations* and *Prose Quotations* were published, respectively, in 1891 and 1893.

AL'LICE, or AL'LIS (Fr. *alose*, from Lat. *alausea*). A European shad (*Alosa vulgaris*), about 20 inches long, caught for food when ascending the rivers to spawn. It is the larger, and considered the better of the two species of European shad, of which the other is called the twaite. These are the maifisch of the Rhine valley.

ALLIER, à'lyâ'. A department in central France bordering on the Loire, formed mainly out of the old province of Bourbonnais. There are marble and granite quarries, and coal and iron mines in the mountains in the southeast. There is considerable farm land and many mineral springs, the ones at Vichy being best known. Area, 2850 square miles. Pop., 1901, 422,024; 1906, 417,961; 1911, 406,291. Capital, Moulins.

ALLIER. A tributary of the Loire, which

has its source in the water-shed in the eastern part of Lozère, a department of France (Map: France, K 6). It flows in a northerly direction, through Haute-Loire, Puy-de-Dôme, and Allier, and after a course of more than 250 miles falls into the Loire below the town of Nevers. It is navigable for 140 miles.

AL'LIGA'TION (Lat. *alligare*, to bind to, tie up). A form of proportion of eastern origin, which appears in the early works of Arabian and Hindu writers, notably in the *Lilavati* of Bhaskara Acharya (c.1150). The process was for several centuries confined to problems concerning the combination of metals. Two forms of alligation were recognized, viz., alligation *medial* and alligation *alternate*. Alligation medial teaches the method of finding the price or quality of a mixture of several simple ingredients whose prices or qualities are known; e.g., What is the fineness of gold produced by mixing 6 ounces of gold 22 carats fine with 4 ounces of gold 17 carats fine? Alligation alternate teaches what amount of each of several simple ingredients, whose prices or qualities are known, must be taken to form a mixture of any required price or quality; e.g., How much gold 700 fine and 900 fine must be melted together to produce gold 800 fine? Problems of this kind are indeterminate; that is, they have more than one solution and are best treated by algebraic equations. Alligation in its arithmetic form has practically disappeared from recent text-books and may be regarded as obsolete.

AL'LIGATOR (Sp. *el lagarto*, the lizard, Lat. *lacertus*, lizard). A genus of reptiles of the family Crocodylidae. True alligators differ from crocodiles in the following respects: The feet are less webbed; the head is shorter and flatter; the long first and fourth teeth of the under jaw fit into pits in the upper jaw, and not into notches between the teeth, and this causes the whole head to be broader and the snout more obtuse than in crocodiles. There are only two species of alligators—the jacare and cayman (q.v.) of Central and South America being classified in a distinct genus. These species are—*Alligator sinensis*, of China, and *Alligator mississippiensis*, of the southern United States. Among the Neocene fossils of the south of England are remains of an alligator, or of a form that approaches very near to it; but this single species comprises all extinct species known, showing that the genus may be of modern origin. Their characteristics are largely those of the other crocodylians (see Crocodile): activity at night, offensive and defensive swinging of the tail, bellowing, egg-laying, etc.; but they are less aquatic than the typical crocodiles and spend much of their time basking in the sun on land. The alligator of the United States originally ranged from North Carolina to the Rio Grande along the coast and up the larger rivers, ascending the Mississippi as far as Jefferson Co., Miss., about lat. 32°; and in favorable places it used to be enormously abundant. It is now rarely seen north of Florida or the coast swamps of Louisiana; and the constant persecution of it for sport, its hide, ivory, or eggs is fast leading toward its extermination. It is estimated by the United States Fish Commission that 3,000,000 alligators were killed in Florida alone between 1880 and 1900. This alligator reaches about 16 feet in length when fully grown, and then is greenish-black above, having lost the yellowish color-bands that belong to its earlier years. It spends

most of the day asleep in the sun on a mud bank or log, slipping into the refuge of the water when disturbed. It is timid and quick to retreat, rarely showing any disposition to attack a man, though boats are sometimes followed. When cornered, or caught upon the hook and hauled ashore, or, as is sometimes done, captured and bound with a rope when asleep, the animal proves an ugly customer, rushing with formidable open jaws at its enemies and striking from side to side with its powerful tail. They are strong and active swimmers, and always on the lookout for swimming animals like muskrats or dogs, and sportsmen have often lost in this manner dogs that have ventured or been sent into the water after game. Alligators lie in wait in shallows, or close to the shore, for such prey also, yet their main fare is fish, salamanders, and the like. Like other crocodylians, it carries its prey to the bottom to be devoured, and then its windpipe and ears are closed against admission of water. The body of the alligator emits a fetid odor, and its flesh, which is white and tender, has a musky taste, yet is eaten by the Indians and some others. During the colder months it burrows into the swamp mud and hibernates, the depth and length of this torpidity being greater, of course, in the more northerly parts of its habitat. Consult Belt, *Naturalist in Nicaragua* (London, 1888).

The breeding of the alligator is thus described by Dr. Hugh M. Smith (*United States Fish Commission, Bulletin XI*, 1891): "The maternal alligator in April or May seeks a sheltered spot on a bank and there builds a small mound. The foundation of the mound is of mud and grass, and on this she lays some eggs. She covers the eggs with another stratum of grass and mud, upon which she deposits some more eggs. Thus she proceeds until she has laid from 100 to 200 eggs. The eggs in the course of time are hatched by the sun, assisted by the heat which the decomposition of the vegetable material generates. As soon as they have 'chipped the shell' the baby alligators are led to the water by the mother, who provides them with food which she disgorges, showing much anxiety for their safety. At this early period of their existence they are exposed to many dangers, being a favorite prey of fishes and turtles." It has been thought that alligators grow very slowly and that about 15 years was necessary for them to reach a length of two feet, while a 12-foot specimen indicated a patriarch of over threescore and ten years. Under extremely adverse conditions of existence, such as cold and lack of sufficient food, the growth may be considerably retarded, but in a favorable environment alligators grow very rapidly. From the time of hatching, an alligator in four years may attain a size large enough to have a commercially valuable hide. The following table showing the *average* increase of growth has been compiled from notes made in the reptile house of the New York Zoölogical Park:

Oct. 1900, hatched.....	Length 8 inches; weight 1 $\frac{3}{4}$ oz.
Oct. 1901.....	Length 18 inches; weight 9 $\frac{1}{4}$ oz.
Aug. 1902.....	Length 23 inches; weight 3 lbs.
Mar. 1903.....	Length 45 inches; weight 14 lbs.
Oct. 1905.....	Length 64 inches; weight 50 lbs.
Oct. 1906.....	Length 72 inches; weight 72 lbs.

Alligators are extensively utilized. Their hides can be tanned into an excellent leather, which has become expensive. The teeth, obtained by rotting the skulls in the ground, are of fine

ivory, and valued for carving into ornaments. They are worth about \$2 a pound (of 50 to 75 teeth). Both flesh and eggs are eaten by some persons, and the eggs are valued because they can be hatched in boxes of warm sand, yielding young alligators to be sold as pets, or killed and made into curious ornaments. Consult Gill, *Smithsonian Miscellaneous Collections*, vol. xlviii (Washington, 1907). See CAYMAN.

ALLIGATOR AP'PLE. See CUSTARD APPLE.

ALLIGATOR FISH. A fish of the family Agonidæ, whose members have an elongated angular body covered with large bony plates that form a coat of mail. The best-known one is *Podotheus aeipenserinus*, a species 12 inches long, found on the northern Pacific coast.

ALLIGATOR GAR. The great gar (*Litholepis* or *Lepisosteus tristæchus*) of the rivers of the southern United States, Cuba, Mexico, and Central America, which is greenish in color and sometimes reaches a length of 20 feet. Its flesh is worthless as food, and its scaly armor often turns a spear or even shot. While it is able to breathe air to a certain extent, yet it soon dies in foul water. See GAR.

ALLIGATOR PEAR. See AVOCADO.

ALLIGATOR TER'RAPIN, TORTOISE, or TURTLE. A snapping turtle, especially the long-necked, long-tailed, very large species (*Macrochelys lacertina*) of the southern Mississippi valley, which may weigh over 100 pounds, and have a head measuring 25 inches in circumference. Its flesh is valued as food. The jaws are so powerful that they can cut through a broom handle. The shell is dull yellow in color, matching the coffee-hued waters of its native river. It feeds on fish, which it captures with a sudden dart of the head as it lies hidden on the muddy bottom. See TURTLE.

AL'LINGHAM, WILLIAM (1824-89). An Anglo-Irish poet, born at Ballyshannon, Donegal. He won attention by *Poems* (1850), some of which had previously appeared in English periodicals. In the same year he came to London and was appointed to a subordinate post in the customs. He received a civil pension of £60 in consideration of his services to literature in 1864; married Helen Patterson, a well-known water-color painter, in 1874, and in the same year became editor of *Fraser's Magazine*. He died at Hampstead. His first collection of poems was followed by *Day and Night Songs* (1854), a new edition of which (1855) was illustrated with woodcuts from designs by Arthur Hughes, Rossetti, and Millais. Among subsequent volumes were *Laurence Bloomfield in Ireland*, an ambitious but unsuccessful narrative poem (1864); *In Fairy Land*, illustrated by Richard Doyle (1870); *Songs, Ballads and Stories* (1877); *The Fairies* (1883); *Flower Pieces, and Other Poems*, with designs by Rossetti (1888). *Mary Donnelly* is perhaps the best known of Allingham's many natural and graceful lyrics. His *Diary*, edited by Mrs. Allingham and Radford, is full of fascinating anecdotes of his friends and contemporaries, among whom were Tennyson, Thackeray, and Carlyle. (London, 1907.)

ALLINSON, ANNIE CROSBY (EMERY) (1871—). An American educator and writer, born in Ellsworth, Me. In 1892 she graduated from Bryn Mawr College. She took post-graduate studies at this college and received the degree of Ph.D. in 1896. In 1893 and 1894 she studied at the University of Leipzig. She was appointed Dean

of Women and assistant professor of classical philology at the University of Wisconsin in 1897. There she remained until 1900, when she received the appointment of Dean of the Women's College of Brown University. In 1905 she was married to Francis Greenleaf Allinson (q.v.). On her marriage she resigned the position at Brown University. She was joint author with her husband of *Greek Lands and Letters* (1909), and contributed on classical and other subjects to reviews and magazines.

ALLINSON, FRANCIS GREENLEAF (1856—). An American philologist and educator. He was born in Burlington, N. J., and in 1876 graduated from Haverford College. He then spent one year in Harvard University. From 1877 to 1880 he was a fellow of Johns Hopkins University, receiving the degree of Ph.D. in the latter year. From 1880 to 1882 he was an assistant professor of Greek and Latin at Haverford College, and from 1882 to 1891 was head master of classics at the University School in Baltimore. He was appointed assistant professor of Greek and Latin at Williams College in 1892. After serving until 1895 in this chair, he was called to be associate professor of Greek and classical philology at Brown University, and became professor of classical philology in 1898. In 1910 and 1911 he was annual professor at the American School of Classical Studies at Athens. His published writings include *Greek Prose Composition* (1895); *Greek Lands and Letters* (with A. C. E. Allinson, 1909). He edited texts of several Greek authors and was a contributor to *Studies in Honor of Basil L. Gildersleeve* (1892). He contributed also to *The American Journal of Philology and Proceedings of the American Philological Association*.

ALLIOLI, ä'lê-ô'lê, JOSEPH FRANZ (1793-1873). A Roman Catholic biblical scholar. In 1830-36 he issued at Nuremberg, in six volumes, Braun's annotated German translation of the Bible from the Vulgate, but so revised as to be practically a new work. It was the first of its kind to receive papal approbation.

ALLIOT, ä'lyô' (JEHAN DANIEL) HECTOR (1862—). A Franco-American archæologist, born at Château des Forestiers, Gironde, France. He graduated from the Lycée Bordeaux in 1879, and later specialized in medicine and chemistry, coming to be known, however, as a writer on art. In 1891 he was associated with Farah Pasha in explorations at Tyre, Asia Minor. As director of the Cliff Dwellers Exploration for the Chicago Exposition in 1893, he made a valuable collection, now the property of the University of Pennsylvania. In 1908 he was appointed professor of art history in the University of Southern California; in 1909 commenced service as curator of the Southwest Museum; and in 1911 occupied the chair of technology in the School of American Archæology. His later archæological work was among the Ute, Hopi, and Pueblo Indians, to whom he devoted over 10 years of research. He became a member of many foreign and American archæological and geographical societies and an officer of the French Academy.

AL'LISON, WILLIAM BOYD (1829-1908). An American legislator. He was born at Perry, Ohio, attended Allegheny and Western Reserve colleges; studied law and practiced in Ohio until 1857, when he removed to Iowa. During the Civil War he was a member of the Governor's staff. Elected as a Republican, he served in the

House of Representatives from 1863 to 1871; was elected to the United States Senate in 1873 and reelected five times. He was an active member of the Senate, serving on many commissions. From 1881 to 1893, and again two years later, he was chairman of the Committee on Appropriations. The essential feature of the coinage act of 1878, known as the Bland-Allison Act, or more properly the Allison Act, was due to him. He was one of the representatives of the United States at the Brussels Monetary Conference in 1892. Twice he was a prominent candidate in Republican national conventions for the presidential nomination. Both President Garfield and President Harrison offered him the Treasury portfolio.

ALLIT'ERA'TION (Lat. *ad*, to + *littera*, letter). The frequent occurrence of the same or similar letters or sounds. In old German, Anglo-Saxon, and Scandinavian poetry alliteration took the place of rhyme. This kind of verse, in its strict form, required that two stressed syllables in the first hemistich and one in the second hemistich should have the same sound, if consonantal, as in the following Anglo-Saxon line:

Flota fāmīg heals fūgle gēlicost.
(The boat with bow of foam likest a bird.)

Alliterative poems continued to be written in English after it had assumed its modern form. The most remarkable is *Piers Plowman*, a poem of the fourteenth century, of which the following is a specimen:

In a somer seson whan soft was the sonne.

Even after the introduction of rhyme, alliteration continued to be largely used as an embellishment of poetry, and is so, though to a less extent, to this day:

Full fathom five thy father lies.—*Shakespeare.*

The fair breeze blew, the white foam flew,
The furrow followed free. — *Coleridge.*

A rag and a bone and a hank of hair. — *Kipling.*

Alliteration is not confined to verse; the charm that lies in it exercises great influence on human speech generally, as may be seen in many current phrases and proverbs in all languages: example, "life and limb," "house and home," "wide wears," "tight tears," etc. It often constitutes part of the point and piquancy of witty writing. Among modern writers this use of alliteration is well illustrated by Sydney Smith: for example, when contrasting the conditions of a dignitary of the English church and of a poor curate, he speaks of them as "the right reverend Dives in the palace, and Lazarus-in-orders at the gate, doctored by dogs and comforted with crumbs."

In the early part of the seventeenth century the fashion of hunting after alliterations was carried to an extreme; even from the pulpit, the chosen people of God were addressed as "the chickens of the Church, the sparrows of the spirit, and the sweet swallows of salvation." *Ane New-Year Gift*, or address, presented to Mary, Queen of Scots, by the poet Alexander Scott, concludes with a stanza running thus:

Fresh, fulgent, flourist, fragrant flower formose,
Lantern to love, of ladies lamp and lot,
Cherry maist chaste, chief carbuncle and chose, etc.

In the following piece of elaborate trifling, given (but without naming the author) in H. South-

gate's *Many Thoughts on Many Things*, alliteration is combined with acrosticism:

A n Austrian army, awfully arrayed,
B oldly by battery besieged Belgrade;
C ossack commanders cannonading come,
D ealing destruction's devastating doom;
E very endeavor engineers essay
F or fame, for fortune, forming furious fray,
G aunt gunners grapple, giving gashes good;
H eaves high his head heroic hardihood;
I braham, Islam, Ismael, imps in ill,
J ostle John Jarovlitz, Jem, Joe, Jack, Jill;
K ick kindling Kutusoff, kings' kinsmen kill;
L abor low levels loftiest, longest lines;
M en march 'mid moles, 'mid mounds, 'mid murd'rous mines.
N ow nightfall's near, now needful nature nods,
O pposed, opposing, overcoming odds.
P oor peasants, partly purchased, partly pressed,
Q uite quaking, "Quarter! quarter!" quickly quest.
R eason returns, recalls redundant rage,
S aves sinking soldiers, softens signiors sage.
T ruce, Turkey, truce! truce, treach'rous Tartar train!
U nwise, unjust, unmerciful Ukraine,
V anish, vile vengeance! vanish, victory vain!
W isdom wails war—walls warring words. What were
X erxes, Xantippe, Ximenes, Xavier?
Y et Yassy's youth, ye yield your youthful yest.
Z ealously, zanies, zealously, zeal's zest.

While recent poets, as Tennyson, Swinburne, and Kipling, employ alliteration combined with vowel distribution, for beautiful sound effects, yet prose writers seem to avoid it, or at least to keep it from becoming obvious. Observe from the *Passing of Arthur*: "And on a sudden, lo! the level lake, and the long glories of the winter moon." Tennyson's alliterations are less obvious than Kipling's; whereas Swinburne revels in the recurrence of like sounds and makes this a part of his metrical theory. Consult Guest, *English Rhythms* (London, 1882), and J. Schipper, *Grundriss der Englischen Metrik* (Leipzig, 1895), and for this use of alliteration in Greek and Latin, Plessis, *Métrique Grecque et Latine* (Paris, 1889); Klotz, *Altrömische Metrik* (Berlin, 1890); and Puhlig, *De Alliterationis Vi et Vsu* (Breslau, 1912). See ASSONANCE; ENGLISH LITERATURE; GREEK LITERATURE; LATIN LITERATURE.

AL'LIUM (Lat. garlic). A genus of plants of the family Liliaceæ containing about 300 species. The commonly cultivated species are onion, garlic, leek, chives, and shallot, and these forms represent the habit of the genus, with its alliaceous (q.v.) odor, bulbs, long and narrow leaves, and umbels of small flowers. Eight or nine species are natives of Great Britain, of which the most common is ramsons (*Allium ursinum*), a species with much broader leaves than most of its congeners. It is most frequently found in moist woods and hedge-banks, but occasionally in pastures, in which it proves a troublesome weed, communicating its powerful odor of garlic to the whole dairy produce. Crow garlic, or wild onion (*Allium vineale*), another British species, is sometimes very troublesome in the same way in drier pastures. Both are perennial, and to get rid of them their bulbs must be perseveringly rooted out when the leaves begin to appear in spring. This species has been introduced into the eastern part of the United States, where it is troublesome in lawns, parks, and pastures. A small quantity of carbolic acid injected into the cluster is said to destroy them. Over 60 species are indigenous to the United States, about 50 of them belonging to the Western States. A number of species are grown indoors or as ornamental plants in gardens. Among these *Allium neapolitanum* is one of the best. If grown out-doors, it needs protection in most localities in the United States.

ALLMAN, ăl'man, GEORGE JAMES (1812-98). A Scotch zoölogist. He was born in Ireland, graduated in 1843 at Trinity College, Dublin, and was in the following year appointed regius professor of botany in Dublin University. In 1855 he was appointed regius professor of natural history in Edinburgh University and, having resigned in 1870, was chosen president of the Linnæan Society in 1874 and president of the British Association in 1879. He received numerous medals from the scientific societies and published *Monograph of the Fresh Water Polyzoa* (1856) and *Monograph of the Gymnoblasic Hydroids* (1871-72).

ALLMERS, ä'l'mërs, HERMANN LUDWIG (1821-1902). A German poet, born at Rechtenfleth, near Bremen. He studied at Berlin, Munich, and Nuremberg and made his first appearance in literature in his *Marschenbuch* (1858; 4th ed., 1902). This was followed by *Dichtungen* (1860; 4th ed., 1900), and *Römische Schlendertage* (1869; 11th ed., 1904), containing observations on Italian life. His drama, *Elektra* (1872; 2d ed., 1895), with music by A. Dietrichs, was very successful. His further works include *Fromm und Frei* (1891), a volume of verse. His complete works appeared in 1891-95 in six volumes. Consult L. Bräutigam, *Der Marschendichter Hermann Allmers* (Oldenburg, 1891).

ALL'MOUTH. The angler or goosfish. See ANGLER.

ALLOA, ă'l'ô-ă. A seaport and the county-town of Clackmannanshire, Scotland, at the mouth of the Forth, and 32 miles by rail from Edinburgh (Map: Scotland, E 3). It is a town of considerable antiquity and is supposed to have been built on the site of the Alauna of Ptolemy. The principal articles manufactured are whisky, ale, cotton, woolen goods, glass, and iron. Considerable coal is obtained from the neighboring collieries, and much of this is exported. Alloa has an excellent harbor, with floating and dry docks. There is regular steamer communication by river with Edinburgh and Stirling. In the neighborhood is Alloa House, supposed to have been built in the thirteenth century, the home of the Earls of Mar and the Erskines, and many Scottish princes. Pop. (police burgh), 1901, 11,555; 1911, 11,893; (parish), 1901, 16,858; 1911, 17,130.

ALLOB'ROGES (Lat. pl.). A people of Gaul whose territory is now Savoy and Dauphiné. Vienna (the modern Vienne) was their chief town. They were subjected to Rome 121 B.C., by Fabius Maximus, and remained loyal.

AL'LOCU'TION (Lat. *allocutio*, a speaking to, from *ad*, to + *loqui*, to speak). A term applied, in the language of the Vatican, to denote specially the address delivered by the Pope at the College of Cardinals on important ecclesiastical or political circumstances. An allocution presents the papal conclusions on subjects which have usually been discussed by ecclesiastical bodies, and which involve political or religious problems of prime importance to the Church, or to some section of it. Though delivered in secret, it is afterward published and is an important ecclesiastical document.

ALLO'DIUM, or ALLODIAL OWNERSHIP (Med. Lat. probably from OHG. *al*, all + *ôt*, *ôd*, property, estate). The free and absolute right of property in land, properly opposed to feudal tenure (q.v.), or the holding of land in subordination to a superior owner. Blackstone is responsible for the view, which has been gen-

erally taken by legal writers of the last century, that a condition of allodial landholding prevailed in England prior to the Norman Conquest, and that this was rapidly superseded by the introduction of the feudal system of land tenure by the Conqueror and his immediate successors, whence Lord Coke's statement that there "is no land in England in the hands of any subject but it is held of some lord by some kind of service." There can be no question as to the universality of feudal tenure, as described by Coke; but it may be doubted whether, in our legal system, the free and unqualified ownership of land—corresponding to the title by which goods and chattels are held—has ever been generally recognized. It is more than probable that from the first the idea of ownership underwent a change when it was transferred from cattle and other personal property to land, and that the owner of land was generally conceived of as having a more or less temporary interest, as holding in subordination to the superior rights of the community, which was somehow regarded as the ultimate and permanent owner. However this may be, we do not find in the books any general recognition of allodial ownership, in the strict sense of the term, anywhere in Europe; and the rapidity with which the feudal system spread over England after the Conquest would seem to indicate that among the Anglo-Saxons such absolute ownership of land was the exception rather than the rule. The terms "alod" and "allodium" do, indeed, occur with some frequency, but usually in a derivative sense, to describe lands which, though held in some form of dependent tenure, are inheritable and thus similar to the modern estate in fee simple. Since the decay of the feudal system in England and its general abolition in the United States, the term "allodial" has come to be applied to the common form of land tenure in subordination to the paramount title of the State, which now commonly prevails, and which, though not entirely free and absolute, has been divested of all the burdensome incidents which were characteristic of feudal tenure. Some of our State constitutions and many of our statutes have expressly declared all tenures to be allodial, in this sense of the term, and in most of the States they are, in the absence of legislation on the subject, deemed to be so. In several of the States, however, tenures partaking more or less of the feudal character still survive. Consult the authorities referred to under REAL PROPERTY.

ALLOG'AMY (Gk. ἄλλος, *allos*, other + γάμος, *gamos*, a wedding) or CROSS-POLLINATION. A transfer of the pollen of one flower to the pistil of another. Allogamy is subdivided into geitonogamy, in which the pollinated flower is on the same plant, and xenogamy, in which it is on a different plant. The opposite of allogamy is autogamy, or self-pollination. See POLLINATION.

ALLON, ă'l'on, HENRY, D.D. (1818-92). An English Congregational leader, born at Welton, near Hull. He graduated at Chestnut College, 1843, and was pastor of Union Chapel, Islington, London, from 1844 until his death. He edited the *British Quarterly Review* from 1865 to 1887. He published, besides sermons, the life of Rev. James Sherman (London, 1863), and that of Thomas Binney, prefixed to his edition of Binney's sermons (1875), and *Land and the Puritans* (1882). He compiled *The Congregationalist Psalmist*. Consult his memorial (1892).

ALLONGE, à'lôn'zhâ', AUGUSTE (1833-98). A French landscape artist. He was born in Paris and studied with Cogniet and Ducornet. He is noted for his charming use of charcoal in landscape work, but his oil paintings, as well, have won approval. His method of using charcoal has almost created a "school" for workers in that material, and his drawings are much sought and highly prized by connoisseurs. His subjects are landscapes of a placid and sylvan kind. Among his works in oil are views on the Somme; among those in charcoal are "Moulin de Givry." He and Camille Bernier were the first to recognize the beauty of Brittany and to find their subjects there. His writings include *Le fusain* (1873) and a later *Grand cours de fusain* (54 plates).

ALLOP'ATHY. See HOMŒOPATHY.

AL'LOPHANE. A fragile hydrated aluminium silicate belonging in the clay group of minerals. It is usually found in amorphous incrustations of a pale sky-blue color, but sometimes of various shades of green, brown, or yellow. Allophane is produced by the alteration of some aluminous silicate, such as one of the feldspars. Acids attack it with the liberation of silica. It occurs in various European localities and at Richmond, Mass., Bristol, Conn., and Morgantown and Friedenville, Pa.

AL'LOPHAN'IC ACID. See UREAS, THE COMPOUND.

ALLORI, àl-lô'rè. The name of two Italian painters, of the later Florentine school.—ALESSANDRO (1535-1607) was a pupil of his father's friend, not his uncle, Bronzino, who brought him up. He afterwards adopted a mannered imitation of Michelangelo. He was chiefly employed in the churches of Florence and Tuscany, in the Ducal Villa Poggio a Cajano, and in portraiture. He wrote for artists a treatise on anatomy.—His son and pupil CRISTOFORO (1577-1621) forsook Alessandro's manner for that of Pagani. A more important artist than his father, although his style is mannered, he was influenced by Andrea del Sarto, attaining beauty of color and delicacy of execution. His most celebrated work is "Judith with the Head of Holofernes" in the Pitti Palace, Florence, with replicas in Vienna and the Uffizi. The Pitti collection also has a fine "St. Julian," the Louvre "Isabella of Aragon Pleading with Charles VIII."

ALLOT'ROPY (Eccl. Gk. ἀλλοτροπία, *allotropia*, variety, from ἄλλος, *allos*, other + τροπος, *tropos*, turn, way, guise), or ALLOTROPISM. A term used in chemistry to denote the existence of an element in several forms differing from each other in their physical properties. By the silent discharge of electricity in an atmosphere containing ordinary oxygen, the latter is transformed into ozone. Ozone can be readily shown to be made up of nothing but the element oxygen; yet oxygen gas and ozone exhibit important differences in their properties; thus ozone (Gk. ὀζων, smelling) has a peculiar and characteristic odor, while oxygen gas is odorless; ozone reacts much more readily with various substances; it has bleaching and disinfectant properties not possessed by oxygen gas, and it is much denser than oxygen. Phosphorus affords another example of allotropism. In ordinary circumstances, and when freshly prepared, phosphorus is a pale yellow solid of the consistence and aspect of wax and to some extent flexible and translucent. It requires to be placed in a vessel with water to keep it from taking fire

spontaneously, and it is very poisonous. The same element, when dried and kept for some time at a moderately high temperature, passes, weight for weight—without addition or subtraction of matter—into a substance known to chemists as *amorphous* phosphorus. The color of this new variety is brownish red; and it exists as a powder which has no odor, does not take fire, and is not known to be poisonous at all. Three allotropic modifications of the element carbon are known: diamond, graphite, and amorphous carbon (pure lamp-black). Of nitrogen, only one—the ordinary inert form—was known until 1911, when Strutt discovered an allotropic modification. This new form is produced from ordinary nitrogen by the electric spark. It exhibits a peculiar luminescence for some time after the sparking has been discontinued and is chemically active, readily uniting with phosphorus, iodine, mercury, and other elements.

The different varieties of sulphur, boron, silicon, etc., furnish other examples of allotropism. Though comparatively few elements have been obtained in more than one form, there seems to be no reason why, in general, any other chemical element should be incapable of existing in two or more allotropic modifications. The existence of allotropic varieties brings to the mind the polymorphism of crystalline substances and the isomerism of organic compounds. From the point of view of the atomic theory, the different allotropic modifications of an element are, probably, made up of molecules containing different numbers of atoms, or else of atoms differently combined: thus a molecule of ordinary oxygen contains two oxygen atoms, and its chemical symbol is O₂; a molecule of ozone contains three oxygen atoms, and its chemical symbol is O₃. A similar explanation of the nature of allotropy in solid elements is, however, purely hypothetical; for nothing is known of the ultimate structure of solids. Consult D. Berthelot. *De l'allotropie des corps simples* (Paris, 1894), and Ouyard, *Etats allotropiques des corps simples* (Paris, 1894).

ALLOUEZ, à'lōō'â', CLAUDE JEAN (1620-89). One of the early French Jesuits who visited the Great Lakes. He founded the Mission of the Holy Ghost on Lake Superior in 1665, explored Green Bay, and established missions among the Illinois Indians, settling at Kaskaskia (q.v.) and continuing there the mission begun by Marquette. He retired in 1679 on the approach of La Salle, an enemy of the Jesuits, and died among the Miamis on St. Joseph's River. Consult an autobiography in *Jesuit Relations* (Cleveland, Ohio, 1900), and Shea, *Catholic Church in Colonial Days*.

ALLOW'ANCE. In military usage, money allowed in lieu of forage, food, horses, clothing, or quarters, or for any extra work or duties that may have been performed. Such allowance constitutes extra pay. In the United States army "allowance" or "allowances" usually refer to the things gratuitously allowed and not to their money equivalent. For example, fuel, light, heat, quarters, and forage are "allowances"; when the equivalent in money is furnished in lieu thereof, this money is called "commutation." See PAY AND ALLOWANCES, MILITARY.

ALLOWANCE OF QUARTERS. See PAY AND ALLOWANCES, MILITARY.

AL'LOWAY KIRK. A ruined church in the parish of Ayr, Scotland, near the mouth of the

Doon, celebrated in Burns's *Tam o' Shanter*. At very short distances from it are the cottage in which the poet was born, the monument erected to his memory in 1823, and the Auld Brig o' Doon, over which Tam o' Shanter made his escape from the witches.

ALLOY' (Fr. *aloi*, from Lat. *alligare*, to bind to, from *ad*, to + *ligare*, to tie). A mixture of two or more metals, usually produced artificially by fusion, although sometimes found native. Alloys are characterized by certain definite properties, which, according to Sir William C. Roberts-Austen, include: liquidation, which is shown by the separation of that constituent which has the lowest melting point when the alloy is heated; density, which seldom corresponds to the mean of those of the constituents of the alloy, being usually either more or less than that shown by the percentage composition; tenacity, which is usually greater than that of the constituents of the alloy, although it is sometimes diminished; hardness, which is almost always increased; extensibility, which is almost always diminished; and fusibility, the melting point being generally lower than the mean of the melting points of the constituent metals.

The great value of metallic alloys in commerce is due to the fact that certain properties which are desirable for practicable purposes may be imparted to many metals by a suitable addition of other metals. For instance, gold and silver are too soft for use as coins when pure, but may be rendered sufficiently hard by the admixture of small proportions of copper. Similarly the hardness of copper is greatly increased by the addition of zinc, yielding brass. In making alloys, the least fusible metal is melted first, after which the others are added. When three metals are used to form the alloy, they are melted in pairs and afterward together. The more important metallic alloys, which are included among the materials of constructive engineering, are the bronzes, the brasses, the coin alloys, and a few alloys of tin, lead, zinc, antimony, and bismuth. The following are the principal alloys, their composition and uses:

Bronze is an alloy of copper and tin. The knowledge of bronze is very old, it being used by the ancients for making coins, weapons, tools, and ornaments. Many of these ancient peoples were very skillful bronze-founders. The principal bronzes are those used in coinage, in ordnance, in statuary, in bells and musical instruments, and in mirrors and the specula of telescopes. *Coin bronze* as made by the Greeks and Romans consisted of from 96 per cent copper and 4 per cent tin to 98 per cent copper and 2 per cent tin. Modern investigations have shown the range of good alloys for this purpose to be quite large, varying from 96 per cent copper and 4 of tin to 80 per cent copper and 14 of tin, the best falling near the middle of this range. *Gun bronze* has different compositions in different countries, but the most common proportion would seem to be 90 per cent copper and 10 of tin, or 89 per cent copper and 11 of tin. When well made, it is solid, yellowish in color, denser than the mean of its constituents, and much harder, stronger, and more fusible than commercial copper: it is somewhat malleable when hot and much less so when cold. *Statuary bronze* is nearly the same composition as gun bronze. It should be rapidly melted, poured at a high temperature, and quickly cooled to get

the best results. *Bell metal* is richer in tin than the preceding, and varies in composition somewhat with the size of the bell, the proportion of tin being the larger in the case of small bells. The range of good practice in bell metal is from 18 to 30 per cent tin and from 82 to 70 per cent copper. Chinese gongs are made from 78 to 80 per cent copper and 22 to 20 per cent tin, and are beaten into shape with the hammer, being tempered at intervals during the process. (See ANNEALING.) Bell metal is dense and homogeneous, fine ground, malleable if quickly cooled in the mold, rather more fusible than gun bronze, but otherwise similar, excelling, however, in hardness, elasticity, and sonority. *Speeulum metal* contains often as much as 33 per cent tin; it is almost silvery white, extremely hard and brittle, and capable of taking a very perfect polish. Bronze for bearings and other friction surfaces in machinery is made of many proportions, varying from 88 to 96 per cent copper, as more or less hardness is required. *Phosphor bronze* (q.v.) is an alloy of copper, zinc, and tin, which has been given exceptional purity by fluxing with phosphorus. It is very tough and hard, and is used for piston rings and valve covers, pinions, cog wheels, screw propellers, etc. *Tobin bronze* and *Bridgeport bronze* are alloys of copper and zinc in the proportion of about 60 to 62 of copper and 36 to 38 of zinc, with small percentages of tin, iron, and lead. It has great tensile strength, and corrodes with great difficulty. *Aluminum bronze* consists of 90 per cent copper and 10 of aluminum, and is malleable and exceedingly tenacious. It has a golden color and is used in jewelry. When the aluminum exceeds 10 per cent, the alloy becomes brittle, and when 20 per cent is reached, it can be crushed in a mortar. *Manganese bronze* is an alloy consisting of about 88 per cent copper, 1½ of tin, 8.7 of zinc, and smaller percentage of iron, lead, and phosphorus; it is much used for making screw propellers. Both Tobin bronze and manganese bronze are in reality more nearly brasses, since the zinc percentage is greater than the tin percentage.

Brass is an alloy of copper and zinc varying in proportions from 10 parts of copper to 1 of zinc to 1 part of copper to 5 parts of zinc. (See BRASS.) Brass is extensively employed in the arts in the manufacture of scientific apparatus and mathematical instruments, the small parts of machinery, and many sorts of hardware. It can be cast, drawn into wire, rods, or pipe, and rolled into sheets. Brass containing 55 to 60 per cent of copper and 45 to 40 per cent of zinc, when heated, can be extended under hydraulic pressure through dies into various forms for structural purposes; this is known as extruded metal. Brass is harder than copper, very malleable and ductile, and can be "stuck" in dies, formed in molds, or "spun" in lathes into vessels of a wide variety of forms. It is a much poorer conductor of electricity and heat than copper and is more fusible. *Aluminum brass* is made of equal weight of aluminum bronze, copper, and zinc. It has a very high tensile strength and has been used for screw propellers.

Other alloys than bronzes and brasses exist in an immense variety, and have numerous applications in the arts and sciences, although they are much less used than the bronzes and brasses. Only a few of these alloys can be mentioned here. *German silver* (q.v.) is an alloy of

copper, zinc, and nickel in the respective proportions of about 60, 20, and 20 per cent. It is used for table utensils, ornaments, and in the form of sheets, and is one of the most difficult alloys to handle in the foundry and rolling mill. *Pewter* is an alloy of tin and copper often mixed with lead. *Britannia metal* (q.v.) is an alloy of tin, antimony, copper, and brass. It and pewter are much used in making table utensils. *Stereotype metal* is an alloy of 16 per cent antimony, 17 of tin, and 67 of lead. (See PRINTING.) *Babbitt metal* (q.v.) is an alloy of 4 parts copper, 12 parts tin, 8 parts regulus of antimony melted together, and 12 parts tin added after fusion. It is used for lining bearings for journals. *Solders* are alloys used for joining metallic surfaces and parts and have a wide range of composition. The soft solders are made of tin and lead; the hard solders are usually made of brass, and special solders are composed of various alloys of copper, zinc, lead, tin, bismuth, gold, and silver. In making solders, great care has to be taken to secure uniformity of composition. For this reason they are often granulated by pouring from a height into water, or by reducing the cast ingots into powder and then remelting the granulated or powdered material. The soft solders are usually sold in sticks, and silver and gold solder in sheets. Platinum is soldered with gold, and German silver with a solder of equal parts of silver, brass, and zinc. The essentials of a good solder are that it shall have an affinity for the metals to be united, shall melt at a considerably lower temperature, shall be strong, tough, uniform in composition, and not readily oxidized. *Type metal* is an alloy of lead and antimony in the proportions of 4 to 1. It is a hard alloy capable of being cast in molds, and taking form very perfectly. *Gold coin* consists of an alloy of 900 parts gold, 75 parts copper, and 25 parts silver. Iron forms compounds with many elements that are used in metallurgical processes, as ferromanganese, ferro-titanium, and ferro-tungsten, which will be considered under IRON AND STEEL. Mercury combines with many metals to form amalgams (q.v.). During the years 1875-78 a board for testing iron, steel, and other metals met at the Watertown Arsenal, Mass., and very thoroughly considered the properties of various alloys. Their report, published in 1881, contains much information on the subject, together with a bibliography. Consult: Guettier, *A Practical Guide for the Manufacture of Metallic Alloys*, translated by Fesquet (Philadelphia, 1872); Larkin, *The Brass and Iron Founders' Guide* (Philadelphia, 1878); Graham, *The Brassfounders' Manual* (London, 1879); Brannt, *Metallic Alloys* (London, 1889); Hiorns, *Mixed Metals, or Metallic Alloys* (New York, 1890); Thurston, *A Treatise on Brasses, Bronzes, and Other Alloys, and their Constituent Metals* (New York, 1897); Roberts-Austen, "Reports to the Alloys Research Committee," *Proceedings, Institution of Mechanical Engineers* (London, 1891, 1893, 1895, 1897, 1899, and 1904); and Howe, *Iron, Steel, and Other Alloys* (Boston, 1903); "Aluminum Alloys," *United States Geological Survey* (1911), and *Metal Industry* (1910).

ALLOYS, MAGNETIC, COMPOSED OF NON-MAGNETIC METALS. Hadfield has discovered that the addition of a certain amount of manganese to iron renders the latter perfectly non-magnetic. In 1904 Heusler made the very remarkable dis-

covery that, conversely, certain non-magnetic metals may be rendered magnetic by alloying them with manganese—itsself perfectly non-magnetic. Thus, copper, aluminium, and antimony are on the list of distinctly non-magnetic metals. Yet an alloy containing 60 per cent of copper, 14 of aluminium, and 26 of manganese is magnetic. Furthermore, and curiously enough, the magnetic property of the alloy may be readily caused to vary. When freshly prepared, the alloy is but faintly magnetic. If heated to 170° C. (c.340°F.) and then suddenly chilled with water, it loses its magnetic property altogether. But if subsequently kept for some time at the temperature of boiling water, or thereabout, it becomes more permanently, and this time quite strongly, magnetic. Alloys of manganese with antimony, too, are distinctly magnetic. An adequate theoretical interpretation of these facts is, in the present state of science, impossible. The conclusion, however, to which they point is, that magnetizability is rather an acquired and variable than an inherent and constant property of matter, and that its ultimate cause may lie, not deeply within the chemical atoms, but rather in the physical conditions produced, as it were, accidentally in certain molecular complexes. This conclusion suggested to Clemens Winkler a possible analogy in radioactivity, and he raised the question whether radioactivity, too, might not be a more or less accidental physical rather than a deep-seated chemical property of substances, and whether radium itself might not be simply common barium with the property of radioactivity acquired.

ALLPORT, SAMUEL (1816-97). An English petrologist, distinguished by his pioneer work in the field of microscopic petrology. He was librarian of Mason College from 1880 to 1887.

ALL-SAINTS' BAY. A bay in the province of Bahia, Brazil, in 13° S. lat. and 39° W. long. (Map: Brazil, K 6). It forms a superb natural harbor, 37 miles long and 27 miles broad, with an easy entrance. It contains several islands, the largest of which, Itapasica, is 18 miles long and 3 miles broad. The town of Bahia (q.v.) is situated on it.

ALL-SAINTS' DAY. In old English, All-Hallows, All-Hallowmas, or simply Hallowmas, a festival of the ancient Christian Church, introduced because of the impossibility of keeping a separate day for every saint. As early as the fourth century, on the cessation of the persecution of the Christians, the Sunday after Easter was appointed by the Greek church for commemorating the martyrs generally; and in the Church of Rome a similar festival was introduced about 610 A.D., when the old heathen Pantheon (the present Rotunda, or Santa Maria de' Martiri) was consecrated, on March 13, to Mary and all the martyrs. But the real festival of All Saints was first made of obligation by Gregory IV in 835. It was admitted into England about 870 and is now a well-recognized day there and wherever the Church calendar is closely followed. The choice of the day was doubtless determined by the fact that a chapel in St. Peter's Church in honor of all the saints was consecrated by Gregory III, in 731, on November 1, which established the date of the Roman observance. In conformity with this local custom Gregory IV ordered the first of November to be universally observed for the commemoration.

ALL SORTS AND CONDITIONS OF MEN.

A story, by Sir Walter Besant, of a wealthy college girl who endeavors to show to the poor of East London a way of escape from the sordid misery of their lives. The People's Palace in East London owes its origin to this novel.

ALL SOULS COLLEGE. A college of the University of Oxford, founded in 1437-38 by Archbishop Chichele, partly as a chantry where prayers should be made for the souls of all Christians (especially such as fell in the war for the crown of France, of which Chichele had been the adviser), and partly as a society of fellows free from the charge of undergraduate students. The college has been noted for the devotion of its members to history and law, subjects in which the founder was distinguished. In late years the number of fellowships has been increased from 40 to 50, and two Chichele professorships have been instituted—one in international law and diplomacy, and one in modern history. The fellows are selected for their distinction in the study of law and history. Among the ecclesiastics who have been enrolled at All Souls College are Sheldon, Jeremy Taylor, and Reginald Heber; among lawyers and statesmen, Blackstone, Gladstone, Salisbury, and Curzon. The Codrington Library contains over 70,000 volumes and is noted as one of the finest law libraries in England.

ALL-SOULS' DAY. A holy day of the Roman Catholic church, which falls on November 2. The object of it is by prayers and almsgiving to alleviate the sufferings of souls in purgatory. For long no especial day was appointed for the commemoration of all the departed who have not attained perfect life. Among the early Christians the names of the departed were entered on the diptychs, or lists, used at the altar, from which the priest read the names of those for whom he was required to pray that God might give them "a place of refreshment, light, and peace." In the sixth century it was customary in Benedictine monasteries for a commemoration of all the departed brethren to be held at Whitsuntide. In Spain the memorial of All Souls was celebrated in the time of St. Isidore on the octave of Pentecost; this seems a Western echo of the Oriental custom of commemorating All Saints on that day, and All Souls on the Saturday before Whitsunday. St. Odilo of Clugny, in 998, ordered that in all monasteries affiliated to Clugny the commemoration of All Souls should follow on the morrow of the Feast of All Saints. Thence the observance of November 2 as All Souls' day spread throughout the West as a universal custom. The day furnishes a place for the survival, among the European peasantry, of many folk-customs from the pre-Christian times.

ALLSPICE (*all + spice*). A name given to the dry unripe berry of the pimento (*Pimenta officinalis*), a small evergreen tree. The berry is supposed to combine the flavor of several spices, especially cinnamon, nutmeg, and cloves; hence the name. The tree is cultivated in the West Indies, especially in Jamaica, for its aromatic leaves and berries. The berries grow in clusters. They are about the size of peas and are used as a spice for seasoning food. The word "allspice" is also applied to the aromatic bark of various other plants, particularly *Calycanthus floridus* (q.v.). For illustration, see Plate of ABUTILON.

ALLSTON, MARGARET. See BERGENGREN, ANNA (FABQUHAR).

ALLSTON, THEODOSIA BURR. See BURR, THEODOSIA.

ALLSTON, WASHINGTON (1779-1843). A distinguished American painter and author. He was born at Waccamaw, S. C., on his father's plantation, Nov. 5, 1779, but passed his childhood and received his education and early instruction in art at Newport, Boston, and Cambridge. Malbone, the miniature painter, was an early friend and adviser, and the portraits of Pine a valuable influence. After graduating from Harvard in 1800, Allston went to Charleston, S. C., where he began his art career. In 1801 he went with Malbone to London and became a student of the Royal Academy, which was at that time under the presidency of his fellow countryman, Benjamin West. In 1804 he visited Paris in company with the afterward celebrated painter Vanderlyn. Here, before going to Italy, he studied in the Louvre the masterpieces of the various schools and showed a decided preference for the rich, glowing color of the Venetians, an influence which held more or less through life. He passed four years in Rome, the companion of Thorwaldsen, Coleridge, Vanderlyn, and Washington Irving, studying the great masters and acquiring their dignified and lofty style, for which he was peculiarly fitted by temperament. He returned to America in 1809, married a sister of Dr. William Ellery Channing, and went again to London, where he painted and exhibited with marked success for seven years. Failing in health, he came home in 1818, and settled first in Boston, afterward in Cambridge, where he passed the remainder of his life in comparative seclusion on account of enfeebled health. He attracted to himself a refined and cultivated circle of friends and admirers; for Allston was a man of scholarly tastes, a rare talker, and a writer of much charm. His temperament was nervous and high-strung. His cast of mind was eminently artistic, imaginative, and of a noble tenor.

Although Allston was esteemed by contemporaries the greatest artist of his day, modern criticism fails to confirm this verdict. His smaller paintings and portraits often show delicacy of drawing and refinement of color; but his more ambitious efforts prove his inability to realize artistically his mighty conceptions. One of the earliest of his important canvases, "The Dead Man Revived" (1810), was purchased by the Pennsylvania Academy of the Fine Arts. Then followed a number of historical and imaginative works: "St. Peter Liberated by the Angel" and "Uriel in the Sun." In America, after his final return, he painted "The Prophet Jeremiah," now at Yale College, his large unfinished "Belshazzar's Feast," now in the Boston Athenæum, and several smaller works, including "Dante's Beatrice," and "Spalatro's Vision of the Bloody Hand," a powerfully dramatic work. The Metropolitan Museum in New York possesses "The Flood" and "A Spanish Girl." His best-known portraits are those of Benjamin West (Boston Athenæum) and Coleridge (National Portrait Gallery, London). His poem, *The Sylphs of the Season*, was delivered before the Phi Beta Kappa Society at Cambridge and subsequently published in London (1813). He wrote also a novel, *Monaldi* (Boston, 1841). His *Lectures on Art* appeared after his death. He died at Cambridge, July 9, 1843, and his

burial took place by torchlight. For his biography, consult the volume on him in Sweester's *Artist Biographies* (Boston, 1879), and the *Life and Letters* published by his relative, J. B. Flagg (New York, 1892).

ALL'S WELL THAT ENDS WELL. A comedy by Shakespeare, produced in 1601, but probably largely written as early as 1595. It was included in the folio of 1623. The plot is based upon a story in Boccaccio's *Decameron*, which had been already borrowed in Painter's *Palace of Pleasure*. Shakespeare, however, added the comic characters of Lafeu, Parolles, and the clown, though without transforming the pathos of the original tale.

ALL-THE-TALENTS MINISTRY. A complimentary designation bestowed by its friends on the English ministry formed by Lord Grenville in 1806. Used in derision by its opponents, it has passed into history as an ironical appellation.

ALLU'VION (Lat. *alluvio*, a washing upon, from *ad*, to + *luere*, to wash). The legal term for land gained from the sea or other waters, public or private, by the imperceptible reliction of the water boundary or the gradual washing up of silt and earth, the scientific and popular term for which is *alluvium*. Alluvion is an accretion (q.v.) to the upland and becomes part and parcel of the land to which it is annexed and the property of the owner of the latter. When the change effected by the water is sudden, or so rapid as to be perceptible from day to day, as where the line of the seashore is altered by a storm, or a river suddenly changes its course, or where the deposit, however gradual, is the intentional result of artificial causes, it is not an alluvion or accretion, and the title to the land so covered or uncovered is not affected. Thus, if the sea suddenly engulfs a tract of upland, the land continues to be the property of its former owner, even though it remain permanently submerged. The division of alluvion between adjoining riparian proprietors, whose division line, if projected, would cut it, is a matter of some difficulty. Among several rules which have been adopted, the simplest is that which on private streams prolongs the division line at right angles with the middle line or thread of the stream. As such middle line is the boundary between opposite riparian proprietors, an island formed in the stream belongs to the proprietor on whose side of the line it lies. If this line cuts the island, the latter is divided by the line. Consult Angell, *Treatise on the Law of Watercourses* (Boston, 1877), and Gould, *Treatise on the Law of Waters* (Chicago, 1900). See AVULSION; RIPARIAN RIGHTS; SEASHORE; WATER RIGHTS.

ALLU'VIUM (from Lat. *ad*, to + *luere*, to wash). A term applied to the sediment transported by rivers and spread over submerged lowlands during periods of flood. This alluvium sometimes forms "flood plains" bordering rivers, or builds up conical heaps, "alluvial cones," at points where rivers debouch from narrow valleys on to lower areas, or constitutes deltas at river mouths. Alluvial soils are among the most productive known, because of the additional fresh material applied to their surfaces during periods of high water. The flood plains of the Nile, Ganges, and Mississippi are illustrations. See DELTA; FLOOD PLAIN; RIVER; SOIL.

ALLWARD, WALTER SEYMOUR (1875—). A Canadian sculptor. He was born at Toronto

and educated in the public schools. In 1889 he was apprenticed to an architect and after five years' study, during which he showed a decided talent for architectural figure-work, began his career as sculptor with the figure of "Peace," surmounting the Northwest Rebellion Monument in Queen's Park, Toronto. He was next commissioned to execute busts of several eminent Canadians for the Art Gallery of the Provincial Museum in that city. Full-length heroic statues of Sir Oliver Mowat, Gen. John Graves Simcoe, J. Sandfield Macdonald, and other prominent Canadians, erected in different cities, attest the popularity and artistic appreciation of his work. His greatest success stands in Queen's Park, Toronto, and is the well-known monument, whose main shaft is 70 feet high, commemorating the Canadian soldiers who fell in the Boer War in South Africa.

ALL'WORTH, LADY. In Massinger's play, *A New Way to Pay Old Debts*, a wealthy widow.

ALLWORTH, TOM. In Massinger's *A New Way to Pay Old Debts*, the stepson of Lady Allworth, and lover of Margaret Overreach.

ALL'WORTHY, THOMAS. The generous squire in Fielding's *Tom Jones*; foster-father of the hero. He is a philanthropic gentleman, an admirable character, understood to be patterned after Fielding's own benefactor and friend, Ralph Allen.

ALMA, ä'l'mä. A river in the Crimea, rising on the northern woody slope of the Yile, south of the Tchatir-Dagh. It flows at first in a northerly direction, then turns to the west, and empties into a small bay on the Black Sea, 17 miles north of Sebastopol. It is about 46 miles long. The vale of the Alma is renowned for the beauty of its scenery and its many magnificent fruit gardens. On the steep banks of this stream, through the channel of which the British troops waded amidst a shower of bullets, a brilliant victory was won on Sept. 20, 1854, by the armies of Britain, France, and Turkey, under Lord Raglan and Marshal Saint-Arnaud, over the Russian army, commanded by Prince Mentchikoff. After five hours of stubborn fighting the Russians were forced to retreat in disorder upon Sebastopol, 17 per cent of the Russians (numbering 33,000, against 62,000 of the allies) having been killed and wounded. The Turks took no active part in the battle.

AL'MA. A city and county-seat of Wabaunsee Co., Kan., 35 miles west of Topeka, on Mill Creek, and on the Atchison, Topeka and Santa Fé and the Chicago, Rock Island and Pacific railroads (Map: Kansas, F 2). It is the centre of an agricultural and stock-raising district and has good water power and a large flour mill. Pop., 1890, 1125; 1900, 966; 1913 (est.), 1100.

ALMA. A city in Gratiot Co., Mich., 90 miles northeast of Grand Rapids, and 40 miles west of Saginaw, on the Pere Marquette and the Ann Arbor railroads, and on Pine River (Map: Michigan, E 5). It is the seat of Alma College (q.v.), the Michigan Masonic Home, and has an excellent high school. The most important manufactures are auto trucks, hay and paper presses, gas engines, beet sugar, furnaces, cement blocks, flour, asphalt mastic, and lumber products. It is one of the best agricultural territories in the State. Alma was settled in 1853 and was incorporated as a city in 1905. The mayor is elected annually, and the council is composed of eight members. The water works

are the property of the municipality. Pop., 1880, 456; 1890, 1655; 1900, 2047; 1904, 3015; 1910, 2757; 1913 (est.), 3000.

ALMA. A city and county-seat of Buffalo Co., Wis., 52 miles northwest of La Crosse, on the Mississippi River and on the Chicago, Burlington and Quincy Railroad (Map: Wisconsin, B 4). It is in an agricultural region, is connected by steamboat with ports on the river, and has some minor manufactures. Pop., 1890, 1428; 1900, 1201; 1905, 1172; 1913 (est.), 1250.

ALMA. In Spenser's *Faerie Queene*, the personification of the human soul, the queen of "Body Castle."

ALMA. A pseudonym of Charlotte Yonge, the novelist.

ALMACK'S, ʔl'mäks. A suite of assembly rooms in King Street, London, built in 1765. They took their name from that of their builder, or, rather, that assumed by him. It is said he was originally a poor Scottish Highlander named McCall, and that as a preparatory step to rising into importance in London, he inverted the syllables of his patronymic. The name of Almack's is chiefly associated with the balls which were held there for many years under the management of a committee of ladies of high rank. The glory of Almack's belongs to a period earlier than the middle of the nineteenth century, but the name has become synonymous with aristocratic exclusiveness. The London club now known as Brooks's, formerly Almack's, was established by Almack in Pall Mall some time before 1763. Consult Timbs, *Clubs and Club Life in London* (London, 1873), and Walford, *Greater London* (London, 1883-84).

ALMA COLLEGE. A coeducational institution at Alma, Mich., under control of the Presbyterian church, founded in 1887. In addition to the college department, conferring the degrees of A.B., Ph.B., and B.Sc., it maintains an Academy, Schools of Music and Art, and Extension Courses, with a total attendance in 1913 of 310 and a faculty of 27. It has a campus of 36 acres valued, with the buildings, at \$175,000, and an endowment of \$400,000. President, Thomas C. Blaisdell, Ph.D.

ALMADA, ʔl-mä'dá. A town of Portugal, in the province of Estremadura, on the south bank of the Tagus, opposite Lisbon. It is built at the foot of a height, on the summit of which is the fortress of San Sebastian, is a great wine depot, and has long been celebrated for its fruit. Near it is the gold mine of Adissa. Pop., 1900, 7913.

ALMA DAGH, ʔl'mä däç'. The ancient *Amanus*. A branch of the Taurus mountain range in Asia Minor.

ALMADÉN, or **ALMADÉN DEL AZOGUE**, ʔl'má-dän' děl á-thō'gá (Ar. mine of quicksilver). A town in Spain, 50 miles west-southwest of Ciudad Real, situated between two mountains in the Sierra Morena chain (Map: Spain, C 3). Its ancient name was Sisapon. It is a pretty town, with a ruined Moorish castle and a school of mines. It owes all its importance to famous quicksilver deposits which were known to the Romans and Moors. In the sixteenth century they were leased to the Fuggers of Augsburg. In 1645 they reverted to the crown. During part of the nineteenth century they were worked by the Rothschilds of London. There are five stages or galleries, the lowest being 1150 feet beneath the surface. The mercury is found in many combinations, but about 10,000 tons of

ore are annually raised, 10 per cent of which is pure metal. Employment is given to 4000 miners. Sulphur and lead are also found in the vicinity. Pop., 1900, 7459; 1910, 8398.

ALMAGEST, ʔl'má-jěst. The greatest work of Claudius Ptolemæus (see **PTOLEMY**) bore the title *Μεγάλη Σύνταξις*, *Megalē Syntaxis* ('great system'). The admirers of Ptolemy changed *μεγάλη*, *megalē*, great, to *μεγίστη*, *megistē*, greatest, and the Arabian translators added the Arabic article *al*, producing *al-majisti*, whence was derived the common mediæval title "almagest." The work contains Ptolemy's important contributions to trigonometry and mathematical astronomy.

ALMAGRO, ʔl-mä'grō. A town of New Castile, Spain, in the province of Ciudad Real, 12 miles east-southeast of Ciudad Real (Map: Spain, D 3). It is situated in a high, arid plain, is well built, and has wide paved streets and a fine square. Brandy, soap, and earthenware are manufactured, and lace-making gives employment to a large number of women in Almagro and the neighboring villages. The surrounding country is celebrated for its beautiful vineyards and olives, and there are many mineral springs. The vine of this region yields the well-known red wine Valdepeñas. Pop., 1900, 8015; 1910, 8310.

ALMAGRO, DIEGO DE (1475-1538). A Spanish adventurer, said to have been a foundling in the Spanish town whose name he bore. He came to America with Pedro Arias de Avilla in 1514 and settled at Darien, whence he removed to Panama in 1519, when that town was founded. In 1524 he formed a partnership with Pizarro for the conquest of a region on the Pacific coast to the south, which was reported to contain gold. The first voyage was a failure. The second voyage, undertaken in 1526, began with a succession of reverses, and Pizarro wished to abandon the enterprise, but Almagro persuaded him to continue, and eventually they were rewarded with the wealth of the Incas' Empire. Pizarro secured to himself and his brothers most of the fruits of victory and deprived Almagro of his fair share of plunder and power. In 1535 Almagro obtained from Charles V the title of Adelantado, or Governor, of "New Toledo," a territory extending 200 leagues along the coast, beginning at the southern limit of Pizarro's grant. A dispute immediately arose as to the boundary between the two grants, Almagro claiming that Cuzco lay within his territory. He returned from an expedition which he had undertaken, without much success, into the snowy plateau region of the southern Andes, to enforce this claim, and entered Cuzco, asserting that he was its legitimate governor. The Marquis Pizarro at once dispatched Espinosa to effect, if possible, an amicable settlement; but Almagro was elated by his recent successes and refused to entertain any compromises. Further negotiations led to a personal conference between Pizarro and Almagro, Nov. 13, 1537, which ended in an altercation, and the two old friends parted, for the last time, in very angry mood. Pizarro's forces gradually forced Almagro back toward Cuzco, near which place he made a stand. A furious battle was fought, April 26, 1538. Almagro was captured, and garroted in the following July.

Almagro's son, **DIEGO (1520-42)**, called *el Mozo* to distinguish him from his father), whose mother was an Indian girl of Panama, was at

first treated kindly by Pizarro; but he soon came under the influence of some of his father's friends, who had formed a conspiracy to overthrow Pizarro. The marquis was murdered on June 26, 1541; the conspirators proclaimed the lad Almagro, who was about 21 years old, Governor of Peru and then promptly quarreled among themselves. When all but one of the leaders had been murdered or had died from fever and exposure, Almagro took matters into his own hands and ordered the execution of the only remaining man of consequence among them. Meanwhile Vaca de Castro, who had been sent from Spain by the government to end the civil war in Peru, arrived and assumed the government. Almagro refused to submit and was attacked by the royal forces, who defeated him in a desperate battle on Sept. 16, 1542. Almagro fled to Cuzco, but was arrested, immediately condemned to death, and executed in the great square of the city.

AL'MAIN. An old name for Germany, derived from that of the *Alemanni* (q.v.).

ALMALEE, ä'l-mä'lë. See ELMALU.

AL'MA MA'TER (Lat. nourishing mother). A name applied to a university or college, and expressing the relation between the institution and the students who have been educated in it. The term is one of affection, and suggests a mutual dependence of university and alumnus one upon the other. The term "matriculation" (q.v.) is derived from the same root and is applied to entrance into a university; it carries the same meaning.

AL-MAMUN, ä'l'mä-möön', ABU ABBAS ABD-ALLAH (783-833). A caliph of the line of the Abbasides (q.v.), distinguished for his intellectual qualities. He was the son of Harun-al-Rashid. When Harun died, his brother Amin succeeded to the caliphate; but his treatment of Al-Mamun led to war, and after five years of fighting Amin was slain and Al-Mamun took his place (813). The early part of his reign was disturbed by revolts and heresies; but when affairs settled down he fostered the cultivation of literature and science throughout his Empire, and Bagdad became the seat of academic instruction and the centre of intelligence. He had books translated from Greek, Pahlavi, and Aramaic, founded astronomical observatories, determined the inclination of the ecliptic, had a degree of the meridian measured on the plain of Shinar, and constructed astronomical tables of remarkable accuracy. He paid more respect to science than to orthodoxy and drew his servants from all countries and all creeds. In 827 he favored the heretical doctrines of the Mutazilites (q.v.), who asserted the free will of man and denied the finality of the Koran. In the latter years of his reign he was involved in war with the Greek Emperor Theophilus, and revolts broke out in various parts of his Empire. In 833, after quelling a disturbance in Egypt, he marched into Cilicia against the Greeks, but died suddenly near Tarsus, leaving the caliphate to his younger brother, who took the name Al Mutasim. Al-Mamun was the author of *Inquiries into the Koran*, a tract on *Signs of Prophecy*, and one on *The Rhetoric of the Priests and Panegyrist of the Caliphs*. Consult Muir, *The Caliphate* (London, 1891). See ARABIA.

AL'MANAC (of disputed origin). A book or table containing a calendar of the civil divisions of the year, the times of the various astronomical phenomena, and other useful or enter-

taining information. Till a comparatively modern date, this additional matter consisted of astrological predictions and other analogous absurdities; it now embraces, in the best almanacs, a wide variety of useful notes and information, chronological, statistical, political, agricultural, etc.

The history of almanacs, like all early history of astronomy, goes back to very ancient times. The Alexandrian Greeks certainly had almanacs, though the time when they first appeared in Europe is not precisely known. The oldest of the copies (manuscript) existing are of the thirteenth and fourteenth centuries; there are specimens in the libraries of the British Museum and of Corpus Christi College, Cambridge. The earliest-known printed European almanac was compiled by the celebrated astronomer Purbach and appeared between the years 1450 and 1461; but the first almanac of importance was that compiled by his pupil, Regiomontanus, for the 57 years from 1475 to 1531, for which he received a munificent donation from Matthias Corvinus, King of Hungary. Bernardo de Granolachs of Barcelona commenced the publication of an almanac in 1487; the printer Engel of Vienna, in 1491; and Stöffler of Tübingen, in 1524. Copies of these are now very rare. In 1533 Rabelais published at Lyons his almanac for that year and renewed the publication in 1535, 1548, and 1550. The fame and popularity of the astrologer Nostradamus, who prophesied the death of Henry II of France, gave such an impulse to the publication of predictions that in 1579 Henry III of France prohibited the insertion of any political prophecies in almanacs—a prohibition renewed by Louis XIII in 1628. Before this, in the reign of Charles IX, a royal *ordonnance* required every almanac to be stamped with the approval of the diocesan bishop.

Prophetic almanacs have circulated very largely in France in the rural districts and among the uneducated. The most interesting of these is perhaps the old *Almanach Liégeois*, a venerable remnant of superstition. It was first published at Liège—according to the invariable title-page which takes no note of time—in 1636, by one Matthieu Laensbergh, whose existence, however, at any time seems very problematical. The *Almanach Liégeois* is a most convenient one for those who are unable to read, for by certain symbols attached to certain dates the most unlettered persons can follow its instructions; thus, the rude representation of a vial announces the proper phase of the moon under which a draught of medicine should be taken; a pair of scissors points out the proper period for cutting hair, a lancet for letting blood. Of course, among innumerable predictions, some may naturally be expected to come to pass. So in 1774 this almanac predicted that in April of that year a royal favorite would play her last part. Madame du Barry took the prediction to herself, and repeatedly exclaimed: "I wish this villainous month of April were over." In May Louis XV died, and Madame du Barry's last part was really played. The credit of old Matthieu was established more firmly than ever. In 1852, a commission having examined between 7000 and 8000 of the national chapbooks, which included a great number of almanacs, pronounced them so deleterious that it became necessary forcibly to check their circulation. Although still in vogue amongst the ignorant, their popularity is greatly on the wane.

In England, so far was any restraint from being put upon the publication of prophetic almanacs, or "prognostications," as they were usually called, that royal letters patent gave a monopoly of the trade to the two universities and the Stationers' Company, under whose patronage, and with the *imprimatur* of the Archbishop of Canterbury, such productions as *Moore's Almanac* and *Poor Robin's Almanac* flourished vigorously; although "it would be difficult to find, in so small a compass, an equal quantity of ignorance, profligacy, and imposture as was condensed in these publications." The memory of Partridge, long employed as the prophet of the Stationers' Company, is preserved in the lively diatribe of Swift, writing under the name of Bickerstaff. There is a legal decision on record in the year 1775, in favor of a bookseller named Carnan, abolishing the monopoly of the Stationers' Company. In 1779 Lord North brought in a bill renewing their privileges. After a powerful speech against the measure by Erskine, who exposed the pernicious influence of the productions published under the monopoly, it was rejected. The Stationers' Company, however, still maintained their ground by buying up all rival almanacs; and it was not until the publication, in 1828, of the *British Almanac*, by the Society for the Diffusion of Useful Knowledge, that the eyes of the English public became opened to the irrational and deleterious nature of the commodity which their own indifference or folly, as much as the selfishness of their purveyors, had hitherto maintained in existence.

In Scotland the earliest almanacs seem to have been produced about the beginning of the sixteenth century. Shortly after the beginning of the seventeenth century the almanacs, or "prognostications," published at Aberdeen had begun to acquire a great reputation. About the year 1677 they were sold for a *plack* each; and the annual circulation amounted, on an average, to 50,000 copies. In 1683 appeared a rival publication, under the title of *Edinburgh's True Almanack, or a True Prognostication*. For a long time Scottish almanacs continued, like all others of that age, to contain little besides a calendar, with a list of fairs, and—what constituted the great attraction—predictions of the weather. But something more instructive and comprehensive became requisite, and the *Edinburgh Almanac* seems to have been among the first to respond to this requirement of advancing civilization; for, by various additions, such as a list of Scottish members of Parliament, it had, in 1745, been extended from the original 16 pages to 36. In 12 years from that date it had swelled to 72 pages; in 1779 it had reached 252 pages. After 1837 it was published under the title of *Oliver and Boyd's New Edinburgh Almanac*, and extended to above 1000 pages.

Almanacs containing astrological and other predictions are still published in Great Britain; but their influence is extremely limited, even among the most ignorant portion of the community, and their contents are fitted to excite amusement rather than any stronger emotion.

In America the publication of almanacs for popular use is confined very largely to the vendors of proprietary or patent nostrums and medicines. These persons distribute the almanacs gratuitously, judging rightly that they constitute a most excellent advertisement of their wares. This is due principally to the fact that people keep their almanacs at hand throughout

the year, and thus the advertisements printed in them are ever present to the public eye. Among the almanacs in the United States that are sold for a small price, the most important are probably the *Old Farmers'*, issued in New England, and those coming from several great newspaper offices. It is believed that the first common almanac in North America was for 1687, from Bradford's press in Philadelphia. Franklin's *Poor Richard's Almanac*, begun in 1732, was kept up by him about 25 years, and was widely known both at home and abroad for its wise and witty sayings. *The American Almanac and Repository of Useful Knowledge* was issued in Boston from 1828 to 1861; a continuation, *The National Almanac*, came out for two years only, 1863 and 1864. Nearly every religious denomination has its special annual, either almanac or year-book; and many trades, professions, and enterprises have similar publications.

The *Almanach de Gotha* occupies a place among almanacs peculiarly its own. First published in 1763, it gives genealogical particulars concerning all the sovereign houses of Europe, the mediatised families of Germany, and most of the European princely and ducal houses of non-sovereign rank. It also contains much valuable information regarding the officers of administration and the statistics of the different political divisions of the globe. Until 1871 it appeared in French; since that time it has been published in both French and German.

Astronomical Almanacs. There are also important astronomical almanacs. The *Nautical Almanac*, published in England, was projected by Nevil Maskelyne, Astronomer Royal from 1765 to 1811, who urged its value in connection with the use of lunar distances for the determination of longitude. The first edition of this work was published with the authority of government in 1767. After Dr. Maskelyne's death it gradually lost its character, and in 1830, in consequence of the numerous complaints made against it, the government requested the Astronomical Society to pronounce upon the subject. The suggestions of the society were adopted, and in 1834 the first number of the new series appeared, with such additions and improvements as the advanced state of astronomical science rendered necessary. Still older than this almanac is the French *Connaissance des Temps*, commenced in 1679 by Picard and now published under the authority of the *Bureau des Longitudes*. Its plan is similar to that of the *Nautical Almanac*, but it has contained a larger amount of original memoirs, many of them of great value. Equally celebrated is the Berlin *Astronomisches Jahrbuch*, issued from the Berlin Observatory.

In the United States, Congress in 1849 provided for the publication of such a work, in which "the meridian of the observatory at Washington shall be adopted and used as the American meridian for astronomical purposes, and the meridian of Greenwich shall be adopted for all nautical purposes." Accordingly the *American Ephemeris and Nautical Almanac* was begun in that year by Charles Henry Davis, of the United States navy, and the first volume (for 1855) was published in 1853. The publication is issued from the office of the *Nautical Almanac*, United States Naval Observatory, in Washington, and contains tables of the predicted positions of the sun, moon, and planets, and of all the fixed stars used in navigation. It is pub-

lished three years in advance, for the convenience of navigators bound on long voyages. These astronomical almanacs are also of the greatest importance to astronomers, as they contain collections of numerical data required in the computation of their celestial observations. Their preparation and publication, however, are so costly that they are possible only to the great financial resources of governments, and it is largely for this purpose that governmental astronomical observatories are maintained.

* **ALMANACH DE GOTHA**, ăl'mă'na' de gö'tă'. See under ALMANAC.

AL'MANDINE (Fr. *almandine*, from Lat. *alabandina*). The red, transparent, precious variety of garnet, so called from Alabanda, a town in Caria, where it was found. This name is given to a violet-colored variety of Spinel ruby.

ALMANSA, ăl-măn'să. A town of Murcia, Spain, in the province of Albacete, 43 miles east by south of Albacete, on the Madrid and Alicante Railway (Map: Spain, E 3). It is situated on a fertile plateau. Almansa carries on manufactures of linen, hempen, and cotton fabrics, the materials of which are supplied from the neighborhood; also of brandy, leather, and soap. Many sheep graze on the fine pastures in the vicinity of this town. Pop. of the commune, 1900, 11,117; 1910, 11,887. Near Almansa the French, under the Duke of Berwick, natural son of James II of England, gained a victory on April 25, 1707, over an army of Spanish and English troops commanded by Henry de Ruvigny, Earl of Galway. See SUCCESSION WARS.

AL-MANSUR, ăl'mân-sōōr' (Ar. The Victorious), ABU JA'FAR ABDALLAH IBN MOHAMMED (712-775). The second Caliph of the house of the Abbasides (754-775). He regulated the finances and the post in the kingdom and patronized learning. One of his great achievements was to found Bagdad. He died during a pilgrimage to Mecca, at the age of 63. See ABBASIDES.

ALMA-TADEMA, ăl'mă tād'ê-mă, SIR LAURENCE (1836-1912). A well-known painter, of Dutch origin and Belgian training, who practiced most of his life in London. His real name was Laurens Alma Tadema, but he adopted the more aristocratic form in England. He was born in West Friesland, Jan. 8, 1836, and studied under Wappers and for a longer period under Leys at Antwerp. Pictures of Frankish life occupied him till 1863, after which he took up Ancient Egyptian subjects for two years, finally devoting himself mainly to depicting the life of the Greeks and Romans. Early essays in this style were the "Warrior of Marathon" (1865), "Roman Amateur," and the "Pyrrhic Dance," which he sent over to the Royal Academy in 1869, in which year he went to live in London. His success was recognized by membership in the Academy in 1879 and knighthood in 1899. His house in Grove End Road, furnished in classic style with exquisite taste and containing his valuable collection of antiquities, was a centre of famous artistic gatherings. Among important pictures are "The Roses of Heliogabalus" (1888), "Spring" (1894), "The Conversion of Paula" (1898), and "Thermæ Antoninianæ" (1899). At the World's Fair of St. Louis (1904) he exhibited the "Coliseum," the "Shrine of Venus," and "Caracalla." Later works are the "Finding of Moses" (1905), "A Family Custom" (1909), and the "Voice of Spring" (1910). His work is remarkable for its careful archæological research. He is pe-

culiarly successful in painting marble and bronze. In composition he is scholarly; his drawing is good, his coloring faithful, but he is at times charged, and not without reason, with a lack of sentiment. His pictures indeed have the value of trustworthy records of the past, but they rarely move more than the intellect. His wife and pupil, LAURA T. ALMA-TADEMA (1852-1909), was a genre painter of delicacy and charm, whose art found inspiration in Dutch genre of the seventeenth century. Consult: Zimmern, *L. Alma-Tadema: His Life and Work* (London, 1886); Georg Ebers, *L. Alma-Tadema* (Eng. trans., New York, 1886); Monkhouse, *British Contemporary Artists* (London, 1899); Standing, *Sir Laurence Alma-Tadema* (New York, 1905).

ALMA-TADEMA, Miss LAURENCE. An English author and poet, daughter of Sir Laurence Alma-Tadema. Her published writings include: *Love's Martyr* and *The Wings of Icarus*, novels; *The Crucifix*, tales; *The Fate Spinner*, a novel (1900); *The Herb o' Grace*, essays (1901-02); *Songs of Womanhood* (1903); *Four Plays* (1905); *Tales from My Garden* (1906). In 1907-08 she gave a course of readings in the United States on the *Meaning of Happiness*, etc. She translated several works of foreign writers.

ALMAVIVA, ăl'mă-vē'vâ, COUNT. A character in Beaumarchais's comedies *Le barbier de Séville*, *Le mariage de Figaro*, and *La mère coupable*, appearing successively as a fascinating young nobleman, a disillusioned husband, and an old gallant.

ALMEH, ăl'mê, or **ALMAI** (Ar. 'ālimah, learned woman, from 'alama, to know). A class of singing girls in Egypt. To enter the almeah one must have a good voice, know the rules of verse, and be able to improvise couplets adapted to circumstances. These girls are in demand at all entertainments and festivals, and at funerals as hired mourners. They are distinct from the *ghawāzī*, or dancing girls, who are of a lower order and perform in the streets.

ALMEIDA, ăl-mă'ê-dă. Formerly one of the chief strongholds of Portugal, situated on the river Coa, on the Spanish frontier, in the province of Beira (Map: Portugal, B 2). In 1762 it was captured by the Spaniards, who soon afterward surrendered it. In their retreat from Portugal, 1811, the French, under General Brenier, destroyed a great portion of the fortifications of Almeida, which, however, were speedily repaired by the English. It is celebrated also for its sulphur waters. Pop., 1900, 2312.

ALMEIDA. A town situated on the east coast of Brazil, in the State of Espirito Santo, near the mouth of the Reis Magos River, 20 miles north of Victoria. It was founded by Jesuits in 1580. Pop., 1912, 5000.

ALMEIDA, FRANCISCO DE (1450?-1510). A Portuguese warrior and empire builder. For his services against the Moors he was made, in 1505, Viceroy of the Portuguese possessions in the East Indies. At Cannanore, Cochin, and Quilon, and in Ceylon and Sumatra he either built fortresses to protect the Portuguese factories or founded new trading posts. His attempt to establish the supremacy of Portugal in the Indian seas brought him into conflict with the Venetians and the Egyptians. In a great battle fought between Lorenzo de Almeida, son of Francisco, and a combined Venetian and Egyptian fleet, in the harbor of Chaul, in 1507, young Lorenzo fell. To avenge his death, Fran-



LAURENCE ALMA-TADEMA
AT THE SHRINE OF VENUS

cisco sacked the ports of Goa and Dabul, and refusing to acknowledge Albuquerque, who had been sent out to supersede him, destroyed the Egyptian fleet at Diu in 1508. Then he resigned his command and sailed for home, but perished in a skirmish with African savages near the Cape of Good Hope.

ALMEIDA - GARRETT, ăl-mă'ê-dă-găr-rêt'/JOÃO BAPTISTA DA SILVA LEITÃO. VISCOUNT OF (1799-1854). A distinguished Portuguese statesman and author, leader of the romantic movement in his country, and its most important poet of the nineteenth century. He was born at Oporto and died at Lisbon. After a boyhood spent in the Azores, under the tutelage of a highly gifted uncle, Bishop of Angra, he attended the University of Coimbra and there imbibed the revolutionary ideas which led him to participate in the revolt of 1820 and three years later resulted in his expatriation. Hitherto his writings, such as the dramas *Merope* and *Catão*, and the didactic poem on painting, *O Retrato de Venus*, reflected the spirit of French classicism and the native "Arcadian" school. In England and France, however, he came under the influence of Scott and the French romanticists, and this influence is reflected in his epic, *Camões* (1825), the burden of which is the poet's longing for his home: and in his equally well-known *Dona Branca* (1826), a long poem, half epic, half lyric, and aimed especially against monastic life. He returned to Portugal in 1826 and suffered a brief imprisonment owing to some political articles. Two years later he was again forced to seek safety in exile: but when, in 1832, Dom Pedro returned from Brazil for the purpose of contesting the throne with his brother, Dom Miguel, Almeida-Garrett joined his forces, and after the victory of 1833 was rewarded with a place in the cabinet as Minister of the Interior. His life henceforth was one of remarkable activity. As a member of the national Cortes, he showed himself an uncompromising supporter of democratic principles and instituted many reforms. He interested himself especially in the founding of a national theatre and a conservatory of dramatic art, and wrote a long series of prose dramas, the central figure in each case being some typical national character, such as *Auto de Gil Vicente* (1838), *De Filippa de Vilhena* (1840), and *Frei Luiz de Sousa* (1844). One of his most important contributions to literature is his *Romanceiro* (1851-53), a collection of 32 early Portuguese ballads and romances, the text of which he freely restored and emended. His last work is a poem, *Folhas caídas* ('Fallen Leaves'), a dramatic record of a love that came in the autumn of life, which for pathos and emotional power is hardly equaled in Portuguese literature. An edition of his collected works appeared after his death (Lisbon, 1854-77). The best biography is that of Gomes de Amorim, *Garrett, Memórias biographicas* (3 vols., Lisbon, 1881-84).

ALMELO, ăl'mă-lŏ'. A town in the Netherlands, 21 miles by rail northeast of Deventer (Map: Netherlands, E 2). Linen and cotton goods are manufactured. There are many churches, in one of which is the family vault of the Von Rechteren, who were lords of the district previous to the fourteenth century. Their castle is here also. Pop., 1889, 8354; 1900, 10,018.

ALMERIA, ăl'mă-rĕ'ă (Ar. The Conspicuous). The capital of the province of Almeria

in Spain, 60 miles southeast of Granada, and the seat of a bishop (Map: Spain, D 4). It stands at the head of the Gulf of Almeria, at the mouth of the river of the same name, and its harbor, which is one of the best in Spain, is well fortified and is 178 acres in extent. Behind it rises a lofty mountain ridge on which is a Moorish fortress. The flat-roofed houses are Oriental in character, and some ruined castles, together with the general appearance of the place, evidence its antiquity. The Gothic cathedral, begun in 1524, is essentially Spanish in its fortress-like outline and battlemented walls. The church of San Pedro occupies the site of a mosque. Other institutions include a normal school and several monasteries. There are manufactures of sugar, white lead, macaroni, etc., but the most important commercial interest in Almeria is its exportation of fruit. It is estimated that 1,000,000 boxes of grapes, each weighing 50 pounds, are shipped from this port annually. Other articles of commerce include oranges, almonds, pomegranates, figs, dates, oil, etc., and iron ore. It is a winter resort for invalids, as its climate rivals that of Nice. Pop., 1910, 45,198. Almeria is one of the most ancient cities of Spain and was founded by the Phœnicians. The Romans called it *Unci*, and *Magnus Portus*, the great harbor. It flourished under the Moors, when, as the proverb says, "Granada was no more than its farm." When it passed into Christian hands (1489), its prosperity languished, and only within recent years have railway facilities brought back something of its former activity.

ALMERIA. In Congreve's *Mourning Bride* (q.v.), the heroine, bride of Prince Alphonso, whom she mourns until his unexpected return. Her rôle is famous for the lines, "Music hath charms," etc.

AL'MERI'CIANS. The followers of Amalric of Bène (q.v.).

ALMIQUI, ăl-mĕ'kĕ (native name). A Cuban insectivore. See SOLENODON: and plate of CAVIES accompanying article CAVY.

ALMISSA, ăl-mĕ'să. A port of the Austrian crownland of Dalmatia, 14 miles southeast of Spalato, at the mouth of the Cetina. The hills in the neighborhood yield an excellent muscatel wine for which the region has become famous. Almissa was at one time the rendezvous of the pirates who infested the Adriatic. It was formerly tributary to Venice as a part of the small republic of Poglizza. Pop. (commune), 1890, 13,200; 1900, 15,100; 1910, 16,645.

ALMODÓVAR DEL CAMPO, ăl'mô-dô'văr dĕl kām'pô. A town of New Castile, Spain, in the province of Ciudad Real, 22 miles southwest of Ciudad Real (Map: Spain, C 3). It stands on the summit of a ridge, near the Vega, a branch of the Guadiana. The streets are tolerably clean but ill paved. There are ruins of a Moorish fortress. The inhabitants are chiefly employed in agriculture, and the only manufactures are domestic. Large flocks of sheep graze on extensive crown lands which are near by, and there are rich seams of coal. Pop., 1900, 11,615; 1910, 13,833.

ALMOHADES, ăl'mô-hădz (Ar. *Al-Muwahhidun*, who proclaim the unity of God). The name of a dynasty that ruled in northwestern Africa and Spain during the twelfth and thirteenth centuries. In the reign of Ali b. Yusuf (1107-43), the second Amir al Muslimin of the Almoravides (q.v.), a religious teacher, Mo-

hammed b. Tumart, calling himself Al Mahdi (the guided), founded the sect of the Almohades in Africa. They were opposed to the realistic anthropomorphism of orthodox Islam. Their leader exercised great influence over the Arabs and Berbers throughout northern Africa. Ibn Tumart (q.v.) imposed on his disciples new ceremonies and wrote for their benefit a special treatise entitled *On the Unity of God*. He found a successor in Abd-al-Mumin. Abd-al-Mumin (q.v.) assumed the title of a Caliph or *Amir al Muminin*. Under him the Almohades rose to great power. They extended their conquests into Spain in 1146, subjugating Andalusia, Valencia, and a part of Aragon, and Portugal as far as the Tagus. Under Abu Yakub Yusuf (1163-84) and Yakub-al-Mansur (see ABU YUSUF YAKUB), the dynasty of the Almohades continued to flourish in great splendor. But in 1212 they were completely defeated by Christians in the battle of Navas de Tolosa, the result of which was a rapid collapse of their power in Spain. The power of the Almohades in Spain terminated in 1257 and in Africa in 1269. Consult: Freeman, *History and Conquests of the Saracens* (Oxford, 1856); Coppée, *Conquest of Spain by the Arab-Moors* (Boston, 1881); Dozy, *History of the Almohades* (2d ed., 1881); Fagnan, "Histoire des Almohades," in *La Revue Africaine* (Algiers, 1892); Luciani, *Le livre d'Ibn Tumart* (1903), with Goldziher's Introduction; Goldziher in *Zeitschrift der deutschen Morg. Ges.* xli, 30-140; Codera, *Decadencia y desaparicion de los Almoravides en España* (1899); Bel, *Les Benou Ghanya* (1903).

ALMON, ä'l'mon, JOHN (1737-1805). An English journalist and bookseller, born in Liverpool. He attended school for a short time at Warrington, was apprenticed to a printer and bookseller, and in 1759 settled in London as a journeyman printer. He soon took to pamphleteering, became a member of the staff of *The London Gazetteer*, and by a pamphlet entitled *A Review of Mr. Pitt's Administration* won the favor of Burke and others of the opposition party at the time of Pitt's resignation (1761). He then became a publisher and bookseller on his own account and was patronized largely by the members of the opposition. He was a close friend and ardent supporter of John Wilkes (q.v.), and in 1780 was fined for selling a paper containing one of the letters of Junius. In 1784 he became proprietor and editor of the *General Advertiser*, but two years later was driven by a libel suit to relinquish this undertaking. He rendered an important service to students of American history by publishing *The Remembrancer* (1775-83), a monthly collection of contemporary documents bearing on the Revolutionary War, especially of such documents "as serve to display the injustice of the design and the folly of the councils of Great Britain." He also published a valuable *Collection of all the Treaties of Peace, Alliance, and Commerce between Great Britain and Other Powers from 1688 to 1771* (1772); *Biographical, Literary, and Political Anecdotes* (1797); and *Correspondence of John Wilkes, with a Memoir of his Life* (1805). By his contest with the authorities he did much to establish a greater freedom of the press. Consult *Memoirs of John Almon, Bookseller, of Piccadilly* (London, 1790).

ALMONACID DE TOLEDO, ä'mô-nâthêd' dâ tôlâ'dô. A little town of Spain in the province of Toledo, connected with Toledo by rail. It

contains an old Moorish castle and is famous chiefly as the place of a battle between Spanish and French forces on Aug. 11, 1809, in which the latter, numbering about 30,000, were defeated. Pop., 1900, 1574; 1910, 1801.

ALMOND, ä'münd (Lat. *amygdala*, Gk. ἀμυγδάλη, *amygdalē*), *Amygdalus*. A genus of the family Rosaceæ, consisting of trees and shrubs. The almond tree (*Prunus amygdalus* or *Amygdalus communis*) grows from 20 to 30 feet high, closely resembles the peach in general appearance and bloom and furnishes the almond nuts of commerce. It is native to the Mediterranean basin and southwestern Asia and has been in cultivation from remote times. The fruit is a drupe with a thin, hard covering, which splits open when ripe.

Almonds are of two kinds—bitter and sweet. The bitter almond is cultivated to a limited extent in Mediterranean countries, and the nuts are used in the manufacture of flavoring extracts and of prussic acid. The sweet, or edible, almond is grown on a commercial scale in the south of Europe, in California, and in some other countries of similar climate. The nuts contain a large quantity of a bland, fixed oil; they have an agreeable flavor, and are used for desserts, in confectionery, and medicinally in an emulsion which forms a pleasant, cooling, diluent drink. There are three classes of sweet almonds—the hard shell, soft shell, and the paper shell almond. The latter two only are important commercially. Of foreign varieties, the long almond of Malaga, known as the Jordan almond, and the broad almond of Valencia, are most valued in the trade. In California success in almond-growing came only with the improvement of selected seedlings of local origin. Ne Plus Ultra, Nonpareil, IXL, and Languedoc are the best known of these. California produces annually about 6,000,000 pounds of nuts. In addition to the home production, the United States imports, annually, about \$3,000,000 worth of nuts. In Syria and northern Africa almonds are grown on dry and stony soils. They are believed to withstand drought better than any other fruit, but are the most susceptible of the deciduous fruits to injury from frost. In California good-paying crops are secured only on fertile, well-drained soils, preferably warm loams; and in the arid regions water for irrigation must be abundant.

The almond is propagated mainly by budding on seedling bitter almond stocks. Trees come into bearing in from two to four years from budding, and reach mature fruitage in from seven to 10 years. On strong land the trees are set at least 24 feet apart each way. The tree is shaped during the first three years' growth, after which little pruning is required. Varieties should be mixed in orchard planting, to insure cross-pollination.

The almond is also widely grown for ornamental purposes in localities where it seldom if ever produces fruit. It is a favorite flowering shrub in England, northern Europe, and parts of the eastern and southern United States. It is one of the earliest fruits to bloom. The peach-like blossoms appear before the leaves.

The flowering almond (*Prunus nana* or *Amygdalus nana*) is a low shrub, seldom more than two or three feet in height. It is common in southern Russia and is frequently planted as an ornament. Another species (*Prunus andersonii*) is found among the hills of southern California,

about the Colorado desert. It is a bushy shrub, and the fruit is a small, velvety drupe, little more than half an inch long. Other species not well known but similar to these are found in the East. Fossil forms of the almond occur in the Miocene Tertiary beds of Oeningen, Germany. See Plate of ACANTHUS.

ALMOND DISEASE. The principal almond disease is that known as leaf-blight. It is caused by the fungus *Cercospora circumcissa*, which attacks the leaves and twigs, and often defoliates the trees by midsummer. Upon the leaves small distinct yellow spots are formed, from which the leaf tissue falls, leaving the leaf appearing as though pierced by numerous shot. The disease may be prevented by spraying the trees before blooming, and about twice after blooming, with the ammoniacal copper carbonate solution. (See FUNGICIDES.) The second spraying should be applied when the trees are in full leaf, and the third two to four weeks later. Almond trees are also subject to crown-gall due to *Bacterium tumefaciens*, and to a common leaf-rust, *Puccinia pruni-spinosæ*. Spraying will control the rust, but there is no known remedy against crown-gall.

ALMONDE, ăl-môn'dă, PHILIPPUS VAN (1644-1711). A Dutch Vice-Admiral, who served under De Ruyter in the fights of 1676, and after the Admiral's death commanded the Dutch Mediterranean fleet. He was with Tromp in subduing the naval power of Sweden in 1677. He commanded in 1688 the fleet which conducted William III to England, and four years afterward gained fame by his defeat of the French at La Hague. In 1702, with the English Admiral, Sir George Rooke, he commanded the allies which destroyed the Spanish fleet in the Bay of Vigo.

ALMONDS, ä'mündz, EXPRESSED OIL OF. A fixed oil expressed from bitter or sweet almonds, and sometimes used in medicine. It has a pale yellow color and a mild, rather agreeable taste. It consists largely of olein.

ALMONDS, VOLATILE OIL OF. See BENZALDEHYDE.

ALMONER, ăl'mün-ēr (OF. *almosne*, alms, from Lat. *eleemosyna*, Gk. *ἐλεημοσύνη*, *eleēmosynē*, mercy, alms). The name given originally to a member of a religious order who distributed the money and other things set apart for alms, which by canonical law was to amount to at least a tenth of the revenues of the establishment. Afterwards ecclesiastics also received this name who were appointed by princes to the same office in their households. The Grand Almoner of France was one of the principal officers of the court and of the kingdom, usually a cardinal, and, in right of his office, commander of all the orders. Queens, princes, and princesses had also their almoners, and bishops were usually appointed to this office. In England the office of Hereditary Grand Almoner is now a sinecure, his only duty being to distribute the coronation medals among the assembled spectators. The Lord High Almoner, usually a bishop, distributes twice a year the sovereign's bounty, which consists in giving a silver penny each to as many poor persons as the sovereign is years of age.

ALMONTE, ăl'mönt. A town in Lanark Co., Ontario, Canada, 35 miles southwest of Ottawa, on the Canadian Pacific Railway (Map: Ontario, G 2). It is a centre for the marketing of agricultural products and manufactures woolen and knit goods and machinery. Almonte was settled

in 1830 and was incorporated as a town in 1881. The government is vested in a mayor, elected annually, and a council. Pop., 1901, 3023; 1911, 2452.

ALMONTE, ăl-môn'tă, DON JUAN NEPOMUCENO (1803-69). A Mexican General and diplomat. He was the reputed son of Morelos (q.v.), the patriot priest. As a mere child he took part in the war of liberation, and in 1815 was sent to the United States to be educated. His diplomatic career began at an early age, and he had filled responsible positions in London and South America before he joined the staff of Santa Anna in 1836, in which year he was made prisoner at San Jacinto. Under Bustamante he was Minister of War, and from 1841 to 1846 was Minister to the United States, retiring when the annexation of Texas had become a certainty. In 1853 he was again Minister to the United States; in 1857 he was Minister to France; he had been twice an unsuccessful candidate for the presidency, and party spirit led him to participate in the French invasion of Mexico and the election of Maximilian. Almonte was proclaimed Dictator of Mexico in 1862, but was distrusted by all parties and was removed the same year. The next year he was President of a junta styled the "Regency of the Mexican Empire." In 1864 Maximilian made him regent of the realm and Grand Marshal, and in 1866 he was sent as Minister to Paris, where he died.

ALMORA, ăl-mō'ră. The capital of the Kumaon division, Northwestern Provinces, British India. It is situated on the crest of a mountain ridge, 5337 feet above the sea, and on the head waters of the Kosila, a branch of the Ramgunga, 87 miles north of Bareilly. It gives its name to a district, has a cantonment for two battalions of Ghurkas, and is a health resort for invalids and consumptives. There are several educational institutions, one of which is Ramsay College. The surrounding region produces tea. Pop., 1901, 8596; 1911, 10,560.

ALMORAVIDES, ăl-mō'ră-vīdz (Ar. al-Murabitun, the hermits). A Moslem dynasty in northwest Africa and Spain. The name is derived from *ribat*, which means 'a fortified place on the frontier' and also 'a hermit's hut.' It was the designation of the place on an island in the Senegal where Abdallah b. Yasin (q.v.) gathered his followers and trained them in religious practices and arms. Hence *al murabitun* came to mean 'the Ribat people,' the followers of Abdallah. As a religious sect the movement started about 1037. During the lifetime of the Mahdi the holy war was conducted by himself and the chiefs of the Sanhaja tribe in southern Morocco, Yahya b. Ibrahim, Yahya b. Umar and Abu Bekr b. Umar. The kingdoms of Sijilmasa (1055) and Aghmat (1056) were conquered. With the aid of Zainab (q.v.) Yusuf ibn Tashfin (q.v.), the nephew of Abu Bekr, became, after the death of the Mahdi (1059), *Amir al Muslimin* and the real founder of the Empire. He built Marrakush (Morocco) and extended his power into Algeria. At the urgent request of the Mohammedan rulers of Andalusia, and especially al Mutamid b. Abbad of Seville, he went across to Spain and defeated the Christians at Zallaka (Sacralias) Oct. 23, 1086. Yusuf b. Tashfin soon made the Moslem princes of Andalusia subject to his authority. He reigned from 1061 to 1107. His son, Ali b. Yusuf, maintained his rule until 1143. In 1147 Morocco fell before

the attack of Abd al Mumin (q.v.), and two years later the power of the Almoravides in Spain ended. Unlike their successors, the Almohades (q.v.), the rulers of this family always recognized the spiritual authority of the Abbaside Caliph in Bagdad. Consult Dozy, *Histoire des Musulmans d'Espagne* (1861); A. Müller, *Islam in Morgen- und Abendland* (1887); Mercier, *Histoire de l'Afrique Septentrionale* (1888); Codera, *Decadencia y desaparicion de los Almoravides en España* (1889); A. Bel, *Les Benou Ghanya* (1903).

ALMQVIST, älm'kvist, KARL JONAS LUDWIG (1793-1866). A Swedish writer of unusual versatility but very unstable genius. He was born at Stockholm. At 20 he left a good post in the civil service and founded a sort of Brook Farm in the forests of Vermland, where the "come-outers" lived under turf, wore homespun, and ate porridge. The experiment failed, and Almqvist resorted to school-teaching and the composition of text-books, at Stockholm, until the publication of a group of romances under the title, *The Book of the Thorn Rose* (begun in 1832), brought him sudden fame. This work shows great power of language and richness of color; and the dramas which followed, though erratic in plan, are masterly in dialogue and of great tragic force. Almqvist now gave himself wholly to literature and published a great number of books and pamphlets on history, religion, ethics, æsthetics, and pedagogy, as well as lyrics, dramas, and novels, chiefly socialistic in tone and often contradictory in teaching, but marked by a brilliant style. His moral instability apparently led him to crime, for in 1851 he was charged with forgery and murder, and fled from Sweden to America, where he earned a precarious living under an assumed name until 1866, when he returned to Bremen, and lived there under the name of C. Westermann until his death, Sept. 26, 1866. Far too little is known of his American experiences, which must have been highly adventurous. The novels and tales on which his literary fame will rest are of the romantic type. The best of the tales are *The Mill at Skällnora*, *Araminta May*, and *Grimstahama's Settlement*. Of the novels, *The Palace* is typically romantic in its poetic humor. A later work, *It's All Right*, is in another key, more like the problem novel of our day, and is a grim picture of the evils of conventional marriage, indicating the degeneracy of his misused genius.

ALMS'HOUSE. The place where the publicly supported poor are cared for, sometimes called the poorhouse, the infirmary, etc., and, in England, the workhouse. Wherever indoor relief is provided, the almshouse is the central local institution throughout the United States for the care of the aged and infirm poor, and also for able-bodied poor who are not committed as vagrants to a correctional institution. It is frequently located on a farm, known as the poor-farm, where light work is given the inmates, the results being utilized to contribute toward their support. The latest available figures give for the United States 2476 almshouses, with 81,764 inmates. Consult: A. G. Warner, *American Charities*, chap. vi (Boston, 1894); C. R. Henderson, *Modern Methods of Charity* (New York, 1904); Special Report of the Census Bureau, *Paupers in Almshouses, 1904* (Washington, 1906); A. Johnson, *The Almshouse* (New York, 1911). See PAUPERISM; POOR LAWS.

ALMUCANTAR, älm'kän'tër (Ar. *al-muḳanṭarāt*, pl. of *al-muḳanṭar*, sun-dial). In astronomy, a small circle of the celestial sphere parallel to the horizon. The word had fallen rather into disuse among astronomers, but has been used of late years as a name for an instrument invented by Chandler. The instrument consists of a telescope supported on a metal float placed in a basin of mercury. This arrangement assures the perfect horizontality of the float, and the telescope can be used to observe heavenly bodies situated at exactly equal altitudes in the celestial hemisphere. Astronomical investigations of considerable importance have been carried out by the use of the almucantar.

AL-MUKANNA, älm'kän'ná. See MOHAMMEDAN SECTS.

AL'MY, JOHN JAY (1814-95). An American naval officer. He was born in Rhode Island and entered the navy as a midshipman in 1829. He engaged in the suppression of the African slave trade in 1843-45 and took part in the capture of Vera Cruz and Tuxpan in the Mexican War. He was in the blockade service during the Civil War, and afterward had a varied life on the coast survey as commander of vessels making expeditions to Central and South America and South Africa, and as an officer on ordnance duty in the Brooklyn Navy Yard. He ended his career as commander of the Pacific squadron, becoming a Rear Admiral in 1873. Four years later he was retired.

ALNASCH'AR. In the *Arabian Nights*, the barber's fifth brother, proverbial as a dreamer. Having put his money into a stock of glassware with which to engage in trade, he falls to imagining what he will do with the wealth he is to gain from it and, inadvertently kicking over the basket, smashes all his wares. The name was humorously applied to S. T. Coleridge from his having dreamed the fragment of *Kubla Khan*, which he wrote after waking.

ALNUS, äln'ūs. See ALDER.

ALNWICK, änn'ik. The capital of the county of Northumberland, England, on the Alne, about 32 miles north of Newcastle (Map: England, E 1). The streets are broad, well paved, and well lighted; the houses modern, built of stone, and in some instances handsome. There are numerous churches and a large park in which are ruins of several abbeys and monuments of historical interest. A large market place occupies the centre of the town. At one time there were many tanning establishments, but milling and brewing are among the industries carried on to-day. Alnwick was at an early period a border stronghold, and some fragments of the ancient walls even yet remain. Alnwick Castle, the residence of the dukes of Northumberland, stands at the north entrance of the town, and is considered one of the most magnificent baronial structures in England. During the Middle Ages it was a bulwark against the invasions of the Scots, who thrice besieged it. Pop., including Canongate, 1901, 6716; 1911, 7041. Consult F. G. Halleck, *Alnwick Castle and Other Poems* (New York, 1836), and C. H. Hartshorne, *Alnwick, etc.* (London, 1860).

ALO'ADÆ, or **ALOY'DÆ** (Gk. Ἄλωάδαι, *Alōadai*, or Ἄλωειδαι, *Alōeidai*), OTUS and EPHEIALTES. The sons of Aloeus, or of Poseidon, and Iphimedeia, wife of Aloeus. They were celebrated for their great size and extraordinary strength. Every year they grew an ell in breadth and a fathom in height, and at the end of nine years

were thirty-six feet broad and fifty-four feet high. They are fabled to have chained the god Ares, and to have kept him in a bronze cask for thirteen months. They also threatened the Olympian gods with war, and would have piled Pelion and Ossa on Olympus had they not been destroyed by Apollo before their beards were grown. It is further said that they fell in love, the one with Hera and the other with Artemis; but, when Artemis appeared to them in the form of a hind and ran between them, they shot at the supposed animal and killed each other. They were worshiped as heroes in some places.

AL'OE, *Lat. pron.* ăl'ô-ē; *Engl. pron.* ăl'ô (Gk. ἀλόη, *aloē*). A genus of plants belonging to the family Liliaceæ, including about 100 species which are natives chiefly in the Mediterranean region, Western Asia, and South Africa. About

probably an introduced plant. The extract prepared from its leaves is known as Hepatic aloes, or as Barbadoes aloes. The Socotrine or Zanzibar aloes is the product of *Aloe Perryi*. The bitter principle of aloes has been called aloin. With oxygen aloin forms several compounds that possess acid properties. In the East Indies it is employed as a varnish to prevent the attacks of insects; and has even been applied to the bottoms of ships to protect them from marine worms. A beautiful violet color which does not require a mordant to fix it, is obtained from the leaves of the Socotrine aloe. It also affords a fine transparent color for miniature painting. Mohammedan pilgrims suspend an aloe over their doors on their return from Mecca, to signify that they have performed the pilgrimage. The American aloe is a different plant. Numerous species are used as decorative



COMMON ALOES.

50 miles from Cape Town is a mountainous tract completely covered with aloes, and the hills on the west side of Socotra exhibit them in similar profusion. The species vary in height from a few inches to 30 feet. They have permanent succulent leaves. The negroes of the west coast of Africa make cords and nets of the fibres of their leaves, and stockings are woven from the fibres of a species found in Jamaica. Aloes are chiefly valuable for their medicinal properties, which are laxative, drastic, emmenagogue, and vermifuge. The well-known drug called Aloes (q.v.) is the inspissated juice of the leaves of several almost tree-like species, and particularly of *Aloe socotrina*, a native of the island of Socotra; *Aloe purpurascens*, *Aloe spicata*, and *Aloe arborescens*, which principally yield the Cape aloes; *Aloe arabica*, *Aloe linguiformis*, *Aloe mitriformis*, and *Aloe vera*; which last, found in the East and West Indies, in Italy, and in some of the islands of the Mediterranean, is the only species which can be reckoned European, although it also is

plants. For this purpose they are grown indoors and set out during summer. They may be propagated by seed, suckers, or cuttings. See AGAVE, and Plate of ACACIA.

ALOES, ăl'ôz. The inspissated juice of the leaves of various species of Aloe (q.v.). A drug of great antiquity, for we find Dioscorides, a writer on materia medica of the first or second century, making mention of aloe as a substance obtained from a plant and possessing cathartic properties. It is obtained from numerous sources, including Bombay, Arabia, Socotra, Madagascar, the Cape of Good Hope, and the West Indies. All these varieties bear large, thick, fleshy leaves, stiff and brittle, pointed, and generally terminating in a strong spine, filled with a mucilaginous pulp, and containing an intensely bitter juice, which yields the medicinal substance of aloe. It is obtained, sometimes in the form of tears, by incision, spontaneous exudation, and inspissation upon the plant; sometimes by spontaneous evaporation of the juice, which exudes by pressure from the

leaves when cut away near the base; sometimes by evaporating the same juice with the aid of heat; and lastly, by evaporating the juice and the decoction of the leaves. The following names are made use of in commerce to denote the various kinds of aloes found in the market: Socotrine, Clear, Cape, East Indian, Barbadoes, and Caballine aloes. The only varieties officially recognized by the Pharmacopœia of the United States are: (1) Socotrine aloes (*Aloe socotrina*), so called from its supposed source, the island of Socotra, near the mouth of the Arabian Gulf. It is a product of *Aloe Perryi*, a plant from the east coast of Africa, the island of Socotra, and Arabia. (2) Barbadoes aloes (*Aloe Barbadensis*) is prepared in the West Indies from *Aloes vera* and other varieties of aloes. Browne's *Natural History of Jamaica* states that the largest and most succulent leaves are placed upright in tubs, that the juice may dribble out. This, evaporated, is sold as Socotrine aloes; but the common aloes is obtained by expressing the juice of the leaves, boiling it with water, evaporating, and pouring it into gourds; whence this kind is often called gourd aloes. Aloes contains an active principle, aloin, and a resin. When employed in small doses, aloes exerts a tonic, and in larger doses a cathartic action. It acts chiefly upon the large intestine, whose contractions it stimulates. It also causes congestion of the pelvic organs. Upon the bowels its effect is slow, requiring 10 to 12 hours. Aloes is an ingredient of a number of laxative pills mentioned in the United States Pharmacopœia. For illustration see ACACIA.

AL'OE'S WOOD, also AGILA WOOD, EAGLE WOOD, or AGALLOCHUM. The inner part of the trunk of *Aquilaria ovata* and *Aquilaria agallocha*, trees native of the tropical parts of Eastern Asia and the Malay Archipelago, and supposed to be the *aloes* or *lign aloes* of the Bible. They are large spreading trees, with simple alternate leaves. Aloes wood contains a dark-colored, fragrant, resinous substance, and is much prized in the East as a medicine, and for the pleasant odor which it diffuses in burning. The resinous substance is found only in the inner part of the trunk and branches, the younger wood being white, and almost scentless. The trees abound in the eastern part of Asia, especially in Cochin China, the Moluccas, and neighboring islands. Aloes wood is not only much prized in the East as a perfume, but many medicinal virtues are ascribed to it. The ancients ascribed to it similar virtues, and so valued it for these and its fragrance, that Herodotus says it once sold for more than its weight in gold. It was regarded almost as a universal medicine. Its very fragrance was supposed to have a beneficial influence, and it was therefore worn about the person. As it admits of a high polish and exhibits a beautiful graining, precious gems were set in it; and it was cut into fantastic forms and worn in head-dresses, etc. There seems to be allusion to a similar use of it in Ps. xlv. 8, "All thy garments smell of myrrh and aloes and cassia." Or perhaps this merely refers to its being employed to perfume clothing. It was also, from a very early period, much used to perfume the apartments of the great. The fragrance continues undiminished for years. Lign aloes is a corruption of *lignum aloes* (aloes wood).

ALO'GIANS, or **AL'OGI** (Med. Lat. *alogiani*, *alogi*, from Gk. *ἀ*, *a*, priv. + *λόγος*, *logos*, word,

reason). A small and obscure sect of heretics in the second century who opposed the Montanists (q.v.), and rejected John's authorship of the Fourth Gospel, and the Apocalypse, holding that the Gnostic Cerinthus was the author.

ALON'ZO THE BRAVE AND THE FAIR IM'OGENE, A ballad by M. G. Lewis (q.v.), known as "Monk" Lewis.

ALOPECIA, ă'lō-pē'shī-ă (Lat. from Gk. *ἀλωπηκία*, *alopēkia*, fox mange; from Gk. *ἀλώπηξ*, *alōpēx*, a fox). A disease characterized by loss of hair from any part of the body. See BALDNESS.

ALORA, ä'lō-ră. A town of Andalusia, Spain, in Málaga province, 18 miles northwest of Málaga. It stands on an elevated site near the right bank of the Guadalhorce, at the foot of the Sierra del Hacho, and in the midst of a fertile country (Map: Spain, C 4). Some of the streets are well built and well paved; some are very steep and irregular. The inhabitants are mostly employed in agriculture, and grain, dates, and fruit are grown. Some spirits and wine are manufactured. The medicinal and mineral springs of Alora are highly valued by citizens of Málaga, who resort in large numbers to this place. Pop., 1900, 10,206; 1910, 10,975.

ALOST, ä'lōst (literally, to the east, from Ger. *Ost*, east, it being near the eastern frontier), or **AELST**, älst. A town in Belgium, the old capital of the province of East Flanders, situated on a tributary of the Scheldt, called the Dender, which is here converted into a canal (Map: Belgium, B 4). It is a walled city with five gates, and has the famous church of St. Martin, an unfinished edifice, in late Gothic, one of the grandest in Belgium, and containing a famous painting by Rubens, depicting Christ appointing St. Rochus tutelary saint of the plague-stricken. In the Grand Place is a statue of Thierry Martens, who was born here, and who introduced the art of printing into Belgium in 1475. There is a town hall (about 1200), a college, a hospital, the royal school for sons of military men, an academy of design, etc. Its industries are weaving in silk, wool, and cotton, flax-spinning, lace-making, and it has a thriving trade in hops and grain. Pop., 1900, 30,100; 1905, 32,163; 1911, 34,336.

ALOY'SIA. See LIPPIA.

ALOYSIUS, SAINT. See GONZAGA, HOUSE OF.

ALP, älp; **ALB**, älb (Swabian) (Lat. *alpes*, perhaps of Celtic origin; Gael. *alp*, rock, cliff), also called the Rauhe Alb or Swabian Jura. A chain of mountains in southern Germany, about 70 miles in length, and from 12 to 15 miles in breadth, extending northeast and southwest, and forming, in part, the watershed between the Neckar and the Danube. It lies almost entirely within the kingdom of Württemberg, but crosses Hohenzollern and is situated from 50 to 100 miles east of the Black Forest, but, unlike the latter region, is clothed with forests of hard wood instead of pine. It forms a table-land intersected by a few narrow, deep valleys. The average height of the system is rather more than 2000 feet. On the north it descends to the Neckar in ridges of rocky cliffs and abrupt pointed headlands, but on the south it gradually slopes away to the level of the valley of the Danube. The scenery is often very picturesque, for the sharp, precipitous crags are frequently crowned with the ruins of the strongholds of some of the famous old German families, such as the Hohenzollerns, Hohenstaufens, etc. The

geological formations of the Swabian Alps are limestones of Mesozoic age, which, though regularly stratified, have been folded to a considerable extent. Caverns of a very remarkable character abound. The valleys at the base of the hills are fertile and produce abundance of wine and fruit, but the high table land has an extremely poor and barren soil. The word "Alp" is sometimes applied to the green pasture lands on the slopes of the mountains in Switzerland.

ALPAC'A, or **PA'CO** (Ar. *al*, the + Peruv. *paca*). One of the two domestic races of the Guanaco (*Lama huanacos*), a cameloid mammal of the Andean region. It is smaller than the llama and more nearly resembles the vicuña, although now considered to have been, like the llama, derived from the guanaco. (See LLAMA.) Its form is very sheep-like, except for the long, erectly carried head; and, although some have run wild, it is mainly known in great, semi-domesticated flocks kept by the Peruvian mountain Indians for the sake of the wool. These flocks graze on the pastures of the loftiest valleys, almost at the snow-line, which seem to be the natural home of the animal and where they have formed interesting instincts and habits of vigilance and protection against sudden storms and snowfalls. These flocks are said to be so careful to keep together that it is impossible to separate a full-grown individual, so that none can be truly tamed which is not taken when very young. Once a year the Indians drive their flocks to stone inclosures or huts and shear the wool, after which the flocks are again turned loose. This custom is prehistoric, and Squier says that many of the shearing huts about Lake Titicaca have stood there since long before the Spanish conquest. The alpaca is known from the equator to Tierra del Fuego, but is most common in Peru and Chile; its flesh is well liked as food, and the animal is occasionally used as a beast of burden. The alpaca's coat consists of a thick growth of woolly hair, varying from black to gray or yellowish, and reaching, when unshorn, a length of some two feet. The annually shorn fleece is about eight inches in length. The fibre is small but strong, elastic, very lustrous and silky, and highly valued for weaving warm and fine cloth. The natives of the Andes have made use of it from time immemorial for their ponchos or blankets, remains of which have been found in the oldest graves of the period of the Incas; but it was not until 1836 that the wool began to be exported to Europe and the manufacture of alpaca shawls, cloth, etc., regularly began. This was due to the sagacity and energy of Sir Titus Salt, whose mills at Saltaire, England, are regarded as the foremost in Great Britain. Now the imports of alpaca wool into Europe and America number many millions of pounds annually; but not all of the so-called alpaca cloth is really manufactured from that wool alone, or even in part. See GUANACO; LLAMA; VICUÑA, and Plate of CAMELS AND LLAMAS.

Attempts have been made to introduce the alpaca into Europe, but not with satisfactory results. The considerable flock formerly existing in the Pyrenees seems to have disappeared. Similarly, the costly trial of acclimatizing them in Australia has failed. An attempt was made in 1821 to introduce the alpaca into the United States; a fund was raised, and in 1857 a cargo of them was shipped to Baltimore; but the result showed that they could not be acclimatized.

ALP-ARSLAN, älp'är-slän' (Strong Lion) (c.1028-72). A Seljuk Sultan. He was born in Turkestan about 1028 and succeeded his uncle, Togrul Bey, as ruler of the Seljuk realm of Persia, in 1063. His first act was to unite the whole of his dominions in one kingdom. He embraced Mohammedanism and took the surname of Alp-Arslan ('Strong Lion'), his real name being Muhammad Ghiyath-ud-Din abu Khvajah. The Caliph of Bagdad gave him the title of Adhad-ud-Din ('Defender of the Faith') and decreed that prayer might be made in his name. He had an excellent vizier, Nizām-ul-Mulk, who was the founder of all the colleges and academies in the kingdom. From 1064 to 1071 Alp-Arslan pursued the course of his conquests and ruled from the Tigris to the Oxus. In 1064 and 1068 he invaded Armenia and Georgia, at that time Christian kingdoms. He next proceeded against the Greeks, who, under their brave Emperor, Romanus IV (Romanus Diogenes), thrice drove the Turks beyond the Euphrates. In August, 1071, a bloody battle was fought near the fortress of Malaskerd, between the towns of Van and Erzerum. Alp-Arslan gained the victory. The Greek Emperor was taken prisoner, and obtained his liberty only by the payment of an enormous ransom. In the following year Alp-Arslan invaded Turkestan, but he perished at Berzem, in Turkestan, by the poniard of Yussuf Kothual, defender of the fortress, whom he had conquered and condemned to death. He was buried at Merv. Consult Bury's ed. of Gibbon's *Decline and Fall of the Roman Empire* (London, 1898).

ALPE'NA. A city and the county-seat of Alpena Co., Mich., 125 miles north of Bay City, on the Detroit and Mackinac Railroad and on Thunder Bay (Map: Michigan, F 3). It is situated in a region containing numerous lakes and is a popular health resort. It has a United States fish hatchery, public library, parks, and municipal electric light and water plants. Large quantities of lumber in various products are exported, and there are fisheries, tanneries, and manufactures of cement, paper, machinery, excelsior, etc. The city has important mineral products, including limestone, clay, and shale. Excellent water power is secured from three dams across the Thunder Bay River, south of the city. Alpena was settled in 1835, incorporated in 1871; its charter, revised in 1897, limits the mayor's term to two years and provides for a city council of 12 members. Pop., 1900, 11,802; 1910, 12,706; 1913 (est.), 15,000.

AL'PENHORN, or **ALP'HORN**. A simple conical, somewhat curved wind-instrument, about 3 feet long, and made of wooden strips. It has a hard-wood cupped mouthpiece and a bell. The notes are the open harmonics of the tube, the quality of tone being modified by the material and by the smallness of the bore in relation to the length of the tube. It is used by the Swiss to convey signals. The melody usually played on this instrument is called the *Ranz des Vaches* (q.v.). The alpenhorn is usually represented in the orchestra by the oboe, English horn, or bassoon. See MUSICAL INSTRUMENTS.

ALPES, BASSES. See BASSES-ALPES.

ALPES MARITIMES, älp mã'rê'têm'. A department of France (q.v.), in the extreme southeast, on the shores of the Mediterranean and confines of Italy. It is formed mainly of the territory of Nice, ceded by Italy to France in 1860. There are many famous health resorts

in this department, as it is one of the most picturesque and one of the most delightful in the country. The area is 1443 square miles. Capital, Nice. Pop., 1906, 344,007; 1911, 356,338.

AL/PETRA/GIUS. See NUR-ED-DIN EL-BETRUJI.

ALPHA AND OMEGA (α [α λφα] and ω [ὦ μέγα, great ω], the first and last letters of the Greek alphabet). A term employed to convey the idea of completeness. The phrase occurs in the New Testament (Rev. i. 8; xxi. 6; xxi. 13) to denote the immeasurable fullness of God and of Jesus Christ; in Rev. i. 8 it is applied to God; in the other passages, to Christ. The Hebrews similarly employed the phrase Aleph and Tau, the first and the last letter of their alphabet, to denote a thing in its entirety. See, e.g., Jalkut Rubeni xvii. 4, xlvi. 4, cxviii. 3. A somewhat similar phrase is found in Isa. xlv. 6, "I am the first, and I am the last," which, applied to God, is intended to express both eternity and universal sway.

ALPHABET (late Gk. ἀλφάβητος, *alphabētos*, from ἄλφα, *alpha* + βῆτα, *bēta*, the names of the first two letters of the Greek alphabet; compare the Late Lat. *abecedarium*, the English A B C, and Russ. *azbuka*, from *azu* + *buki*, the names of the first two letters). An alphabet may be defined as a series of characters, usually having a fixed order, employed to represent the single sounds of a language. Strictly speaking, this definition applies only to an alphabet like those of Greece and India in which the vowels as well as the consonants are represented. But the term is also used of the Semitic alphabets that made no attempt to represent vowel sounds. The series of signs for consonantal sounds invented by the Egyptians has also been called an alphabet, though it was never relied upon exclusively, but always more or less supplemented by symbols for words, ideograms, and determinatives. Sometimes the word is likewise employed, loosely and improperly, to designate a system of characters denoting syllables or combinations of elementary sounds. For the various modes employed to represent language, see WRITING; HIEROGLYPHICS; CUNEIFORM INSCRIPTIONS. For the variations in the style of writing at different periods, see PALEOGRAPHY.

The Greeks appear to have been the first to invent an alphabet in which the single sounds of their language, vowels as well as consonants, were expressed by a series of letters. Before the invention of this alphabet Greek colonists on Cyprus had used a syllabary in which the five vowels *a*, *e*, *i*, *o*, and *u* were represented by single letters, but the syllables, beginning with a consonant, were evidently pronounced either with or without the vowel. But the earliest form of the Greek alphabet, without the letters ϕ , χ , and ψ , meets us on Crete, Melos, and Thera, and it is natural to look in that direction for the origin of this most advanced type of alphabetic writing. There was a connection, however, between this alphabet and the one used by the Semites in Syria, suggesting that it was brought to the Greeks by the Phœnicians. This was the view held by many of the Greeks, as appears from the statements of Herodotus and other ancient writers and from the word *φοινικῆια*, *phoinikēia*, which denotes the letters of the alphabet and occurs in an inscription of Teos in Asia Minor belonging to the first half of the fifth century B.C. It is true that others attributed the invention of the alphabet to such

mythical characters as Prometheus, Musæus, Palamedes, and Cadmus, who originally had no connection with Phœnicia, while the addition of certain letters was assigned to Epicharmus and Simonides. Special interest attaches to a statement by Diodorus that "the Cretans have an answer to those who attribute the invention of letters to the Syrians, and who say that the Phœnicians learned them from these and passed them on to the Greeks, this being done through Cadmus and those with him sailing to Europe, so that the Greeks call the letters Phœnician; to this they reply that the Phœnicians were not the original discoverers of letters, but that they simply changed their forms" (v, c. 74). A real tradition probably did not exist anywhere. The foreign names of many of the letters and the similarity in form and order observed by travelers would naturally give rise to the idea of a Phœnician origin. Unfortunately, we do not know whether the 11 or 12 Semitic names were originally used, whether the ending *a* in nine cases is the Aramaic emphatic or a Greek addition, and why the Semitic names of seven or eight other letters were not employed. But, as may be seen from the accompanying table, the forms of the earliest Greek letters bear a close resemblance to those of the North Semitic alphabet. Moreover, the order of the letters in the North Semitic alphabet, as shown by their numerical values and their use in acrostic compositions, is the same as that proved for the Greek by similar evidence and by the so-called *abecedaria*, or alphabets found on early vases. The proximity in both alphabets, of Beth, 'house,' and Daleth, 'door,' Jodh, 'hand,' and Kaph, 'palm of the hand,' Mem, 'water,' and Nun, 'fish,' Resh, 'head,' Peh, 'mouth,' and Shin, 'tooth,' can scarcely be explained except by a common origin. It seems probable, therefore, that the Greek alphabet is an adaptation of a consonantal alphabet invented in Syria. It is possible that more than one type of alphabet appeared in Syria about the same time. Besides the North Semitic alphabet, the South Semitic may also have originated there. This alphabet, in which more than 2000 Minæan, Sabæan, Katabanian, and Hadramautian inscriptions are written, is likely to be as old as the other. There is as yet no consensus of opinion as to the age of the Minæan inscriptions; but Glaser, Winckler, Schmidt, Weber, and Grimme have adduced many reasons for believing that some of them go back to the end of the second millennium B.C. (See MINÆANS.) Attempts have been made, notably by Lidzbarski, to show how the letters could have been derived from the North Semitic, but they have not been convincing. In the present state of our knowledge it is doubtful whether the southern Semites derived their alphabet from their northern kinsmen, as there is much that seems to indicate that both branches are indebted to a common source. Whatever be the relation of the Semitic alphabets to one another, the present evidence points to the conclusion that the consistent employment of a small number of signs to denote, not words nor syllables, but the elementary sounds of a language, originated among the Semites, and that through the trading branch of this family, the Phœnicians, this system of writing was carried to the Greeks and the West. Though the attempts to assign meanings to all the Semitic names of the letters has not proved successful, there can be no doubt

ALPHABETS

HEBREW NAMES	GREEK NAMES	HEBREW	PHOENICIAN	EARLIEST GREEK	EAST GREEK (MILITAS)	WEST GREEK	LATER GREEK	EARLY LATIN	LATER LATIN
ALEPH	ALPHA	א	𐤀	Α	ΑΑ	Α	Α	ΑΑ	Α
BETH	BETA	ב	𐤁	Β	Β	Β	Β	[Β]	Β
GIMEL	GAMMA	ג	𐤂	Γ	ΓΛ	ΓC	Γ	C	C
DALETH	DELTA	ד	𐤃	Δ	Δ	ΔΔD	Δ	Δ	D
HE	EPSILON	ה	𐤄	Ε	ΕΕ	ΕΕ	Ε	E	E
WAW	(DIGAMMA)	ו	𐤅	Ϝ	(F)	[F]		[F]	F
ZAYIN	ZETA	ז	𐤆	Ζ	Ζ	Ζ	Ζ		(G)
CHETH	ETA	ח	𐤇	Η	ΗΗ	ΗΗ	Η	Η	Η
TETH	THETA	ט	𐤈	Θ	ΘΘ	ΘΘ	Θ		
IOD	IOTA	י	𐤉	Ι	Ι	Ι	Ι	Ι	Ι
CAPH	KAPPA	כ	𐤊	Κ	Κ	Κ	Κ	Κ	Κ
LAMED	LAMBDA	ל	𐤋	Λ	ΛV	ΛL	Λ	Λ	Λ
MEM	MU	מ	𐤌	Μ	Μ	ΜΜ	Μ	Μ	Μ
NUN	NU	נ	𐤍	Ν	Ν	ΝΝ	Ν	Ν	Ν
SAMECH	(XI)	ס	𐤎		Ξ		Ξ		
AYIN	OMICRON	ע	𐤏	Ο	Ο	Ο	Ο	Ο	Ο
PE	PI	פ	𐤐	Π	Π	ΠP	Π	Π	P
ZADE		צ	𐤑		(M)				
KOPH	(KOPPA)	ק	𐤒	Ϟ	Ϟ	Ϟ		Ϟ	Q
RESH	RHO	ר	𐤓	Ρ	ΡΡΡ	ΡP	Ρ	Ρ	R
SHIN	SIGMA	ש	𐤔	Σ	ΣΣ	ΣΣ	Σ	Σ	S
TAU	TAU	ת	𐤕	Τ	Τ	Τ	Τ	Τ	T
	UPSILON			Υ	ΥV	ΥV	Υ	VY	V
	PHI				ΦΦ	[+X=ξ]	Φ	+	X
	CHI				Χ	[ΦΦ=φ]	Χ		
	PSI				ΨΥ	[ΥV=χ]	Ψ		
	OMEGA				Ω		Ω		

that at least 11 are significant; Aleph means 'ox'; Beth, 'house'; Daleth, 'door'; Jodh or Jadh, 'hand'; Kaph, 'hollow of the hand'; Mem, 'water'; Nun, 'fish'; Ain, 'eye'; Peh, 'mouth'; Resh, or Rosh, 'head'; and Shin, 'tooth.' This leads naturally to the conclusion that the characters were originally representations of these objects, or at least showed some resemblance to them. Inquiry in this direction leads, however, to no satisfactory result as to the origin of the letters, though it may throw light on that part of the Semitic world where the names arose. As the peoples of Syria had intimate connections with Egypt, and as the hieroglyphic and hieratic systems had been in use there for centuries before the earliest known Semitic inscriptions, it was natural to look to the valley of the Nile for the symbols from which the letters had been derived. In a course of lectures given at Paris in 1838, Lenormant attempted to identify the Phœnician letters with Egyptian hieroglyphics; and in 1859 Emmanuel de Rougé read before the Académie des Inscriptions et Belles Lettres a paper in which he sought to prove that the source of the alphabet was to be found in the hieratic characters, as shown in the Papyrus Prisse, an Egyptian document which cannot be later than the eleventh dynasty and may well be much earlier. De Rougé's arguments were first published in detail after his death by his son, in *Mémoire sur l'origine égyptienne de l'alphabet phénicien* (Paris, 1874), in which also a summary of Lenormant's views appeared for the first time in print. De Rougé's opinion was adopted by Canon Isaac Taylor in his book *The Alphabet* (London, 1883), and has been retained in the second edition (1899). Breasted, *History of Egypt*, p. 484 (1905), maintains that with the papyrus the hand that was customarily written upon it also passed into Phœnician before the tenth century. But Ed. Meyer, *Geschichte des Altertums*, i, 1, p. 217 (3d ed., 1910), who thinks that a Phœnician invented the Semitic alphabet c.1000 B.C., deems it historically irrelevant where he obtained his signs and important only that he employed the principle, already discovered thousands of years before in Egypt, of separating the individual sound and using a sign for it. A new turn to the discussion was given by the discovery in 1887 of the Telel-Amarna tablets containing a series of letters written in Syria in the beginning of the fourteenth century B.C., which showed that at that time the cuneiform characters were used by the Phœnicians and other Semites even for correspondence with the Egyptian court and that the Babylonian was evidently the language of international relations. Even before this time Deecke, in *Zeitschrift der deutschen Morgenländischen Gesellschaft*, pp. 103 ff. (1877), and Hommel, *Geschichte Babyloniens und Assyriens*, p. 54 (1885), had attempted to show a connection between the Phœnician alphabet and the cuneiform of Assyria or Babylonia. Delitzsch, *Die Entstehung des ältesten Schriftsystems* (Leipzig, 1897), and Peiser, *Studien zur orientalischen Altertumskunde* (1900), have developed the Babylonian theory, though with differences in detail. This theory, however, labors under one serious difficulty. The early Babylonian characters which are supposed to throw light upon the Phœnician prototypes are probably more than 2000 years older than the earliest Phœnician inscriptions and differ decidedly from the cuneiform characters in use in Syria within 250 or 300 years

of the time when the alphabet must have been developed. Peiser has shown that there was a certain principle of arrangement of the Babylonian signs; but Zimmern's attempt to prove a Babylonian influence on the order of the alphabet is not convincing, *Zeitschrift der deutschen morgenländischen Gesellschaft*, p. 670 (1906). It is now known that the Babylonian signs had names (see Viktor Christian, *Die Namen der Assyrisch-Babylonischen Keilschriftzeichen*, 1913), but the names of numerous objects found in both are not arranged in the same order. Similar objections may be brought against De Rougé's derivation from the earlier hieratic. Neither the Egyptian nor the Babylonian origin can, therefore, be regarded as proved.

But Babylon and Egypt were not the only great powers of the early civilization of the East. The Hittites (q.v.) had a hieroglyphic system of their own, which might easily have influenced the Phœnicians, but the alphabet is far more likely to have developed from a linear than from a hieroglyphic system of writing. The Cypriote Greeks down to the fourth century B.C. made use of a syllabic system which in some of its signs shows a resemblance to the Hittite. The value of these signs has been established. In some respects this script furnishes a closer approach to the alphabet than any other that is known to us. Of the greatest importance, however, is the discovery of at least two early systems of writing on the island of Crete. One of these is distinctly pictorial or hieroglyphic, the other (and later) is linear, and contains a number of forms closely analogous to the Phœnician and early Greek characters. Over 2000 inscriptions have been found, most of them in the archive of the palace at Cnosus. (See the account of Ægean Culture under ARCHÆOLOGY.) We know from Egyptian inscriptions that the Philistines took part in the invasion by seafaring Mediterranean peoples of Egypt and Syria, in the reign of Rameses III (c.1200 B.C.), and from the Bible that the Philistines came from Caphtor (Crete) and that Cretans were in the bodyguard of David. It is natural that the discoverer of ancient Crete and its wealth of epigraphic material should have thought of this connection between the island and Syria. Already in 1895 he hinted at a Cretan Philistine influence on the development of the Semitic alphabet (*Cretan Pictographs*, p. 102). In a paper read before the First International Congress for the History of Religion at Paris, in 1900, Schmidt suggested that the North and South Semitic alphabets developed independently in Syria during the twelfth century from a common source, that this source was the script brought over by the Philistines from Crete, and that some of the characters retained their original designations, while others were translated into the language of Canaan. The Cretan origin was also maintained by Fries, *Zeitschrift des deutschen Palästina-Vereins*, pp. 118 ff. (1900), though he looked to the cuneiform system for the names and order of the letters; and by Dyer in lectures delivered in America, 1900-01. Evans has developed his theory most fully in *Scripta Minoa* (1909). The importance of this Ægean element in the discussion cannot be fairly estimated until the Cretan linear and hieroglyphic systems are at least partially understood, for as yet none of the values of the signs is known. It is obvious that mere external likeness is insufficient to prove a common origin;

there must be sufficient resemblance in sound or meaning to account in some degree for the choice of that particular sign by the borrower to serve as a letter in the new alphabet. This is emphasized by Peters, in *Journal of the American Oriental Society*, pp. 177 ff. (1901), who, without committing himself to any theory, characterizes Evans's proposition as "certainly not lacking in plausibility." W. M. Flinders Petrie, in his recent work on the *Formation of the Alphabet* (London, 1912), develops his theory, originally propounded in the eighteenth *Memoir of the Egyptian Exploration Fund*, pp. 31-32 (London, 1900), that the origin of the Græco-Phœnician alphabet is to be sought in ancient signaries or series of signs "that had been gradually brought into use for various purposes." These signs, originally placed on articles of pottery for the purpose of indicating ownership, were given a commercial value and spread by trade from land to land "until the less known and less useful signs were ousted by those in more general acceptance." He asserts that they were already in use in Egypt in prehistoric times. Some two dozen of these signs finally triumphed and became common property to a group of trading communities along the Mediterranean in the form of a kind of short-hand. But Weill, in *Revue Archéologique*, i, 213 ff. (1903), Daressy, in *Annales du Service*, vi, 103, and Eduard Meyer, *Geschichte des Altertums*, i, 2, p. 61 (1909), have urged serious objections against this interpretation of the signs and regard them simply as factory marks without any phonetic value. Such signs of owner or maker meant for recognition, but not as sound-symbols or letters, are used in all ages. Stucken's theory, based on a relation of the alphabet to the signs of the zodiac, assumes a significance of some of the letters and an acquaintance with the zodiac in Syria at the time of their invention that cannot be proved.

The most important inscriptions written in the North Semitic alphabet coming from the earliest period (c.1000-539 B.C.) are the following: (1) on a bronze bowl found at Limassol, Cyprus, in 1877, dedicated by a servant (governor or vassal) of Hiram, King of the Sidonians, to Baal Lebanon, c.970 B.C.; (2) on a number of ostraca found in the palace of Omri and Ahab at Samaria in 1910, dated in the years of a king who is probably Ahab (872-853 B.C.); (3) on a stele found at Diban in 1868, erected by Mesha, King of Moab, after the death of Ahab, c.850 B.C.; (4) on a stele found at Zenjirli in 1902 and published in 1911, erected by Kilamu, King of Ya'udi, c.840 B.C.; (5) on a stele discovered by Pognon in 1903 and published in 1907, erected by Zakir, King of Hamath and La'ash, c.800 B.C.; (6) on a statue to Hadad found at Gerjin in 1890, erected by Panamu, King of Ya'udi, c.780 B.C.; (7) on a stone found at Zenjirli in 1891 inscribed by Bar Rekab, King of Samal, in the time of Tiglath Pileser IV (745-728 B.C.); (8) on a tombstone found at Tachtali Bunar in 1888, dedicated by Bar Rekab, King of Ya'udi, to Panamu, in the time of Tiglath Pileser IV; (9) on weights found by Layard at Nineveh in 1853 from the eighth and seventh centuries B.C.; (10) on a stone found at Gezer in 1908, giving a calendar, probably from the eighth century B.C.; (11) on a rock in the Siloam tunnel discovered in 1880, from the time of Hezekiah (715-686 B.C.); (12) on some seals published by Levy in 1869 and

Clermont Ganneau from the eighth and seventh centuries; (13) on a stone found at Hasanbey-li, near Zenjirli, by Luschan in 1895 from the eighth or seventh century B.C.; (14) on a bronze bowl found at Olympia, Greece, from the seventh century B.C.; (15) on a silver bowl found at Wladikaukaz in Caucasus, from the seventh century B.C.; (16) on the colossi at Ipsambul, Nubia, found in 1845, from the time of Psammetichus II (594-588); (17) on a stone found at Nora, Sardinia, probably from the seventh or early part of the sixth century B.C.; (18) on a golden medallion found at Carthage in 1894, probably from the seventh or sixth century; (19) on a stone found at Malta in 1820, probably from the seventh or sixth century B.C.; (20) on a stone from a temple at Taima, northwestern Arabia, found by Huber in 1880, probably from the sixth century B.C.; and (21) on two stones found at Nerab, near Aleppo, from the seventh or sixth century B.C.

All of these exhibit the alphabet in substantially the same form, whether they are written in Phœnician, Aramaic, Moabitish, or Hebrew. The same general type is preserved in all Phœnician and Punic inscriptions, though the hand becomes more and more cursive in the later Carthaginian. It was also used by the Samaritans for the Pentateuch, their Aramaic Targum, and other works, while the Jews adopted, even for the Hebrew Scriptures, the square Aramaic characters. These appeared already in an early form in Egypt, as the Elephantine papyri (q.v.) show, and developed into a great variety of distinct types among the Aramaic-speaking peoples. (See ARAMAIC LANGUAGE AND LITERATURE.) The Aramaic script employed in various parts of the Achæmenian Empire spread beyond the realm of Aramaic speech. It became modified into the Pahlavi (q.v.) of the Arsacid and Sasanian periods, and subsequently into the alphabet in which our manuscripts of the Avesta (q.v.) are written. From the legends on coins it is evident that the Kharosthi alphabet of India, in which some of the Asoka (q.v.) inscriptions are written, goes back to the Aramaic script of the Achæmenian period which may have been introduced in India already by the governors of Darius I (521-485 B.C.). The Brahmi alphabet, in which the majority of the Asoka inscriptions are written, was already at that time used in India. Whether this script was likewise derived from the Aramaic is a moot question. At present, however, there is a strong tendency to regard it as having for its basis the South Semitic. The age of this alphabet and the relations between South Arabia and India render such a derivation possible. Like the Greek alphabet, those of India introduced supplementary signs for the vowels, fewer in the Kharosthi, and more in the Brahmi. The former is read from right to left, the latter from left to right. From the Brahmi the devanagari (q.v.) is a later development. It spread into Thibet and was introduced into China by Kublai Khan (q.v.). The alphabets used in Ceylon, Burma, Siam, and Cambodia, as well as in Korea and Japan before the introduction of the Chinese, came from another branch of the Brahmi. The South Semitic alphabet was introduced also in Abyssinia several centuries before our era (see ETHIOPIC) and is still used in writing the Amharic, the Tigre, and the Tigrina. The script of the Safaitic, Lihyanian, and Thamudene in-

scriptions is generally regarded as an offshoot of the Sabæan, but its age and relation to the South Semitic cannot yet be determined. On the origin of the Arabic script see ARABIC LANGUAGE AND LITERATURE. The Arabian letters, with some modifications, were adopted for later Persian and Turkish.

When the Greeks invented their alphabet is uncertain. It can scarcely have been earlier than 1000 B.C., nor later than the eighth century, as it evidently succeeded the Dorian invasion, but preceded the great colonizing movement, since the colonies regularly use the same alphabet as the mother city. Our earliest extant inscriptions come from the seventh century, and no inscription mentioned by the ancient Greeks was earlier than the middle of the eighth. The most important change they had to make in the alphabet invented in Syria was to introduce signs for the vowels. As such they used Aleph, He, Waw, Yodh, and Ayin. Among the wealth of sibilants offered, Zain was universally appropriated for the double consonant Zeta (probably *dz*); as between Samech, Tzade, and Shin there is great diversity of usage among epigraphists as to the exact course of the development. In the Ionian alphabet, which ultimately came into general use, the place of Samech was filled by Xi (χ), Tzade was dropped, and Shin used for the simple *s* sound. A history of the numerous local variations in the Greek alphabet lies outside the scope of this article. It is enough to mention the chief varieties, which were influential in the development of borrowed alphabets. The primitive alphabet, omitting Xi and ending with Upsilon, is found in early inscriptions of Thera, Melos, and Crete. To this alphabet were added three supplementary signs, and in the method of this change the Greek alphabets after the seventh century fall into two great groups, the Eastern and Western. The former includes Asia Minor, the islands of the Ægean, and some points on the Greek mainland; the latter includes Eubœa, most of the States of Greece proper, Sicily, and Italy. It is to be noted that the lines of demarcation are not those of the dialects nor of the races, though the Eastern group is largely Ionian, and the Western Dorian. Attica occupies a middle position. The Eastern alphabet adopted $\Xi = \xi = x$, and added $\Phi = \phi = ph$, $\chi = \chi = ch$, and $\Psi = \psi = ps$. The Western alphabet shows $\chi = \xi = x$, $\Phi = ph$, $\chi = ch$, $\Psi = ps$ was expressed by $\pi\sigma$ or $\phi\sigma$, or in some cases by a new sign \star . As to the origin of these signs, Prætorius, in *Zeitschrift der deutschen morgenländischen Gesellschaft*, p. 676 (1902); p. 715 (1904), suggests that the very similar Saffaitic signs became known to some Greeks, in Damascus, c. 800 B.C. and adopted by them; while Evans, *Scripta Minoa*, p. 92 (1909), perhaps more plausibly suggests that they were taken directly over from some South Semitic source. Possibly we should then think of the Minæan alphabet, which we know to have existed at the time, and the forms of the letters likely to have been familiar to some extent in the Philistine Negeb and Gaza. The curious diversity in their use still lacks a satisfactory explanation. Among the East Greeks also arose the differentiation of the *e* and *o* sounds; after some variations, the short *e* came to be denoted by E, while for the long *e* was chosen the original aspirate (H); O was appropriated for short *o*, and for long *o* a new symbol (Ω) was invented. Waw or

Digamma (F) was disused, as the sound had been early lost among the Ionians. In adopting the alphabet, the Greeks seem at first to have adopted also the direction of writing, from right to left, but very early to have become more independent and to have adopted the form where the lines run alternately from right to left and left to right, like the course of the oxen in plowing, whence the name *βουστροφηδόν*, *boustrophedon*. But the direction was unimportant, and the early inscriptions show many strange variations. It was not until the fifth century that the habit of writing from left to right supplanted the earlier forms.

Through the Greeks the alphabet was brought to Italy, and naturally in the Western form, since the oldest settlement, Cumæ in Campania, was made by colonists from Chaleis and Cumæ in Eubœa. From the Chaleidian alphabet the Etruscan and Latin alphabets were derived. Many other local variations developed; but most of the Italian alphabets preserved throughout their history the original direction of the writing. The Latins, however, probably because of growing intimacy with the Greeks, adopted the later Greek method. Our earliest Latin inscriptions come from the sixth century B.C. The Greek alphabet was not adopted in its entirety. The aspirates (*th*, *ph*, *ch*) were not needed, and Z, though perhaps existing in early times, was soon dropped. Its place was later taken by G, a differentiation of C, which seems for a time to have done duty for both the *k* and *g* sounds, as K early fell into disuse, if it did not actually disappear. About the time of Cicero, for the transcription of Greek names, the characters Y (U) and Z were introduced at the end of the alphabet. This Latin alphabet, as spread by the Roman conquests, became the alphabet of most of the modern European languages. The Slavs, however, derived theirs from the Greek of the ninth century A.D. In its early ecclesiastical form it is said to have been the invention of the missionary Cyril, who found it necessary to add 12 signs to express the Slavonic sounds. In Russia it has undergone various modifications, but is still used by Russians, Servians, Bulgarians, and Croatians. Poles and Czechs received the Latin alphabet with the Roman Catholic faith. The number of letters was afterward increased to 48, and in the reign of Peter the Great again reduced so as to form the present Russian alphabet of 35 letters. See RUNES and OGAM for primitive Germanic and Irish writing, and GLAGOLITSA and KIRILLITSA for the Slavic alphabets.

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barski, *Handbuch der nordsemitischen Epigraphik* (Weimar, 1898); *Ephemeris für Semitische Epigraphik*, vols. i-iii (1900-1913); G. A. Cooke, *North-Semitic Inscriptions* (1903); Stanley A. Cook, in *Quarterly Statements of the Palestine Exploration Fund*, pp. 184 ff. (1909); Driver, *Notes on Samuel, with an Introduction on Hebrew Palaeography* (2d ed., Oxford, 1913); articles on *Writing* by Bevan in *Encyclopædia Biblica* (1903), on *Alphabet* by Taylor, in Hastings, *Dictionary of the Bible* (1902), on *Alphabet* by Lidzbarski, in *Jewish Encyclopædia* (1901). For the Greek alphabet, see Kirchoff, *Studien zur Geschichte des griechischen Alphabets* (Gütersloh, 1887); Wiedemann in *Klio*, vol. viii, pp. 523 ff. (1908), vol. ix, pp. 364 ff. (1909); Beloch, *Griechische Geschichte*, vol. i, 1, pp. 224 ff. (2d ed., 1912); Roberts, *Introduction to Greek Epigraphy* (Cambridge, Eng., 1887); Reinach, *Traité d'épigraphie grecque* (Paris, 1885); Larfeld, in Müller's *Handbuch der klassischen Altertumswissenschaft*, vol. i (Munich, 1892); *Handbuch der griechischen Epigraphik*, vol. ii (1904), i (1907). For the Latin alphabet, consult: Ritschl, *Priscæ Latinitatis Monumenta Epigraphica* (Berlin, 1862); Hübner, *Exempla Scripturæ Latinæ Epigraphica a Cæsaris Morte, etc.* (Berlin, 1885); also Hübner in Müller's *Handbuch*, vol. i (1892). On the Indian alphabets, see Rapson, "Indian Coins," in *Grundriss der indo-iranischen Philologie* (1896); Bühler, in *Journal of the Royal Asiatic Society*, p. 389 (1898). On the development of the Arabic script, consult article on "Arabische Schrift," by Moritz in *Enzyklopaedie des Islam* (1910).

ALPHABETICAL NOTATION. In music. See **MUSICAL NOTATION**; **NUMERICAL NOTATION**; **TABLATURE**.

ALPHAND, ăl'fän', JEAN CHARLES ADOLPHE (1817-91). A French civil engineer. He was born at Grenoble, studied at the Ecole Polytechnique, and was appointed an engineer at Bordeaux. He was appointed chief engineer of the improvements of Paris in 1854, director of works in 1871, and in 1878 director of water supply and drainage. In 1857 he was chief engineer of roads and bridges, and in the Franco-Prussian War was Colonel of an engineer corps charged with the task of strengthening the fortifications of the capital. He divides with Baron Haussmann the honor of having reconstructed Paris and is to be credited with an important share in the plans for the expositions of 1867, 1878, and 1889. He was the author of a work on the parks, boulevards, and promenades of Paris (1867-73), one describing the trees and flowers of the same city (1874), and of *Art in Gardens* (1886).

ALPHE'US (Gk. Ἀλφειός, *Alpheios*). The chief river of the Peloponnesus (Morea), rising in the southeast of Arcadia and flowing west through Elis and past the famous Olympia into the Ionian Sea. This river is one of the most celebrated in ancient song and is connected with a beautiful and characteristic Greek legend. The upper course of the Alpheus was of a sort likely to affect strongly the imagination of the Greeks. In its passage through Arcadia, a country consisting of cavernous limestone and abounding in shut-in basins and valleys, it twice disappears under ground and rises again. After these feats it was deemed capable of anything—even of flowing under the sea—and the Greek colonists of Sicily thought they recognized it in

their new country. Close on the margin of the sea in the island of Ortygia (the site of Syracuse), was the beautiful and copious fountain of Arethusa, and its fresh water was believed to be that of the Alpheus. As evidence it was asserted that, when the river overflowed its banks, the refuse of Olympia polluted the fountain, and that a golden cup, thrown into the Alpheus at Olympia, reappeared in Arethusa. This popular belief was reflected in a favorite story of the later classical times. The river-god Alpheus became enamored of the nymph Arethusa while she was bathing in his stream. To escape him, she prayed to Diana, who changed her into a fountain and opened up an underground passage for her to Ortygia. The river still pursued, and, passing from Greece to Sicily below the sea without mingling his waters with it, united with his love in the fountain.

ALPHONSE, ăl'fôn's' (1220-71). Count of Poitiers and Toulouse, son of Louis VIII of France. He took part in the sixth crusade (1248-54), led by his brother, Louis IX (St. Louis), with whom he was taken prisoner at Mansurah. He also accompanied King Louis on the seventh crusade (1270), against Tunis, where he fell fatally ill. His administration of the affairs of his domains was prudent and just and made in general toward increased autonomy and centralization.

ALPHONSINE, ăl-fôn's'in, **TA'BLES**. See **ALFONSINE TABLES**.

ALPHONSO. See **ALFONSO**.

ALPHON'SUS MARIA DI LIGUORI. See **LIGUORI**.

AL'PINE CLUBS. Societies established primarily to promote a spirit of fellowship among lovers of the sport of mountaineering, later fostering mountain exploration and scientific research. The earliest and most noted is the Alpine Club, of England, organized in London in 1857. The Italian and the Swiss Alpine clubs followed in 1863, after which the movement gained rapidly in extent and popularity, until at its jubilee in 1907 the original society could count no less than 166 descendants, representing nearly every civilized country. Some of these national societies are very large, having sections at various centres of population. The German and Austrian society had, in 1912, 403 sections and a total membership of 93,500. Nearly all these clubs are open to women. The original English club being an exception, a woman's society, the Lyceum Club, was organized at London in 1907. In America the first society of the kind—of a purely social nature—was founded in the college coterie at Williams-town, Mass., as early as 1863; the largest is the Appalachian Mountain Club (q.v.), founded in Boston in 1876. On the Pacific coast are the Sierra Club (1892) at San Francisco, the Mazamas (1894) at Portland, and The Mountaineers (1906) at Seattle. The American Alpine Club (1902) is organized more nearly on the lines of the original society and has a limited membership (80 in 1913), but admits women. The Alpine Club of Canada (1906), with headquarters at Banff, devoted chiefly to the study of the Canadian Rocky Mountains, has had a phenomenal growth—over 800 members in 1913.

The more important societies have encouraged geographical exploration in remote mountain ranges—the Himalayas, Tian Shan, Andes, Alps of New Zealand, Alaska, Equatorial Africa, etc.

There now exists a large body of Alpinistic literature, which began in 1859 with the Alpine Club's *Peaks, Passes, and Glaciers*, which was continued in the *Alpine Journal*, 1863. Certain of the continental societies have published extensively. *Appalachia* (12 vols.), *Alpina Americana* (2 nos.), the *Sierra Club Bulletin* (9 vols.), and the *Canadian Alpine Journal* (5 vols.) represent the literary activity of the American societies.

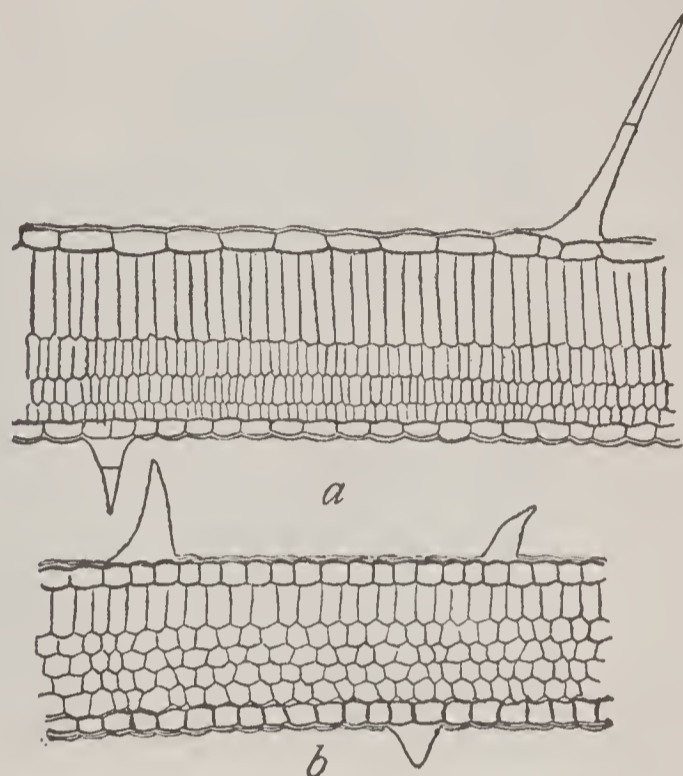
ALPINE PLANT. A plant whose natural habitat is in high altitudes. These plants form one of the three great climatic groups of xero-

where in mosses, is found in many seed plants, which sometimes resemble a brain coral in general effect. 5. The rosette habit is frequent. 6. The flowers and roots of Alpine plants, in striking contrast to the stems and leaves, are not reduced; they may even be increased. This combination makes the roots and flowers appear gigantic, and travelers, as a consequence, are always struck with the relatively large floral development. 7. Alpine leaves show decidedly xerophytic structures, many plants having thick-



Spring beauties (*Claytonia*) from the eastern lowlands (a) and Alpine districts of the Rocky Mountains (b). Note that the Alpine form shows great stem reduction, moderate leaf reduction, flowers relatively unchanged, and increased root system.

phytes (q.v.) and have in general the ordinary xerophytic structures. Among the leading peculiarities of Alpine vegetation may be noted: 1. The gnarled and twisted aspect of the shrubs and trees; so characteristic is this habit in the mountain pine of Europe that the tree has been called by the Germans *Krummholz*, i.e., 'crooked wood.' 2. The vegetation is notably dwarfed. 3. The plant axes are commonly horizontal rather than vertical, and as a result there are a great number of creeping plants. 4. The "cushion (Ger. *Polster*) habit," so common else-



Cross-section of leaf of Germander (*Teucrium*) from the Alpine regions (a) and the lowlands (b). Note the greatly increased leaf thickness and palisade development in the Alpine leaf. After Bonnier.

skinned, leathery evergreen leaves, as the pines and rhododendrons, while others have hairy leaves, as the edelweiss. Kerner, *Die Abhängigkeit der Pflanzengestalt von Klima und Boden* (1869), and Bonnier, *Cultures expérimentales dans les hautes altitudes* (1888 to date), have carried on some remarkably interesting experiments to determine the influence that Alpine climates exert upon plants. Lowland plants were taken into Alpine regions and were found to assume structural features similar to those usually found in Alpine plants but not usually found under lowland conditions. In particular, subterranean organs were found to increase in size, while aerial stems became reduced and tended toward horizontality. The leaves became smaller and thicker and often more hairy; sometimes the leaves showed more red coloration. The flowers became relatively, and in some cases absolutely, larger and more highly colored, and blossoming often took place earlier than in the lowlands. Structurally the leaves showed a thicker cuticle and increased development of palisade cells. Bonnier found that these plants increased in Alpine characters year by year, and that, when taken again to the lowlands, the Alpine features were not lost for a long time. In general, the structures of Alpine plants are similar to those of Arctic plants, but it has been noticed that the leaves are thinner and show more differentiation, intercellular spaces are fewer, and palisade cells better developed. Hairy plants are perhaps more characteristic of Alpine than of Arctic regions. The Alpine conditions are peculiar and are chiefly due in the last analysis to the rarefied air. The consequent decrease in pressure has probably a direct

effect on vegetation, but experiments have not yet made this clear. In any event, the thin air causes a greatly increased intensity of heat and light by day and a greatly increased radiation of heat by night. Thus great extremes of temperature are the rule. The rarity of the air also prevents great rainfall. These conditions, together with exposure to wind, work in harmony toward the development of a highly xerophytic flora, as has been previously mentioned, and it is easy to see how none but xerophytes can survive in such a location. The differences between Arctic and Alpine conditions may be summed up thus: Arctic light is more constant, but less intense, and this perhaps accounts for the differences in leaf structure and color intensity in Arctic and Alpine regions, as stated above. The changes of temperature are more rapid in Alpine districts. The xerophytic structures of Alpine plants are perhaps due to causes set in operation by thin air, while in Arctic plants the causes may be set in operation rather by the cold or even frozen soil. See also MOUNTAIN PLANT, and the plate showing ALPINE VEGETATION, accompanying this article.

ALPIN'IA. See GALANGALE.

ALPINO, ál-pē'nō, PROSPERO (1553-1617). A Venetian botanist and physician. He anticipated Linnæus in determining the sexual differences of plants, and one of his papers gave Europe the first notice of the coffee shrub. He filled the chair of botany in the University of Padua for many years. His best-known work is *De Plantis Ægyptiis Liber* (Venice, 1592; Padua, 1640). The genus *Alpinia* is named after him.

ALPS. The word "Alp" is of uncertain origin. By some it is said to be Celtic from *alb*, meaning 'high'; by others to be from Lat. *albus*, 'white'; but by the residents of these mountains, Alp is never used except as meaning the grassy "benches" or plateaus which are to be found abundantly at various high altitudes and which in summer afford pasturage for great numbers of cattle. The "Alps," then, in native phraseology means these plateaus and not the peaks, though in general usage it includes all—peaks, alps, valleys—the range as a whole. The name is applied collectively to a mountain system of southern Europe, which includes most of Switzerland, and extends into France on the west, Austria on the east, Italy on the south, and Germany on the north, and covers altogether an area of some 80,000 to 90,000 square miles (Map: Europe, D 4).

The system rises from the shore of the Mediterranean west of the Gulf of Genoa, and at first trends northward to the west of the plain of Lombardy; then swinging to the east, it stretches with an east and west trend through Switzerland and across the north of Italy into Austria. The total length of the system is upward of 600 miles, and its breadth ranges from about 75 to about 150 miles. It contains hundreds of peaks exceeding 10,000 feet, and its crowning summit, Mont Blanc, has an altitude of 15,781 feet. In the extreme northeast, where the Alpine system reaches the Danube, it is met by a range belonging to the great system of the Carpathian and Sudetic mountains. On the west the Alps are connected with the Jura Mountains. In the south the Apennines form a great continuation, extending through Calabria and into Sicily. The Cévennes in southeastern France constitute in a measure a connecting link with

the Pyrenees. The range of mountains known as the Dinaric Alps, on the borders of Dalmatia and Bosnia, are a connecting link between the Alpine system and the Balkan Mountains. The slopes upon the south, to the plains of Lombardy, are much more abrupt than those on the north, to the lower lands of Switzerland and Austria. This broad, complex mountain region is the source of many of the great rivers of Europe. The western slope of that part of the range which trends north from the Mediterranean shore is drained into that sea by the Rhone, while the east slope of this part, together with the southern slope throughout Italy, is drained into the Adriatic mainly by the river Po. The north slope is drained into the North Sea by the Rhine, and into the Black Sea by the Danube, which flows around the eastern end of the mountain system. The head branches of these rivers, aided by the glaciers at their sources, have eroded this mountain mass into a complex of short ranges and ridges, many of which have received distinctive names.

Subdivisions. The Alps are commonly, but quite arbitrarily, divided into three portions. The Western Alps comprise that portion having a north and south trend, and extending northward to the Great St. Bernard Pass; the Central Alps extend thence eastward to the Brenner Pass, while the Eastern Alps include the remainder. In the Western Alps the ranges and ridges are broken and irregular, while in the other parts of the system the secondary ranges trend more commonly parallel to the axis of the system. The system is still further subdivided into groups or ranges separated from one another more or less completely by stream gorges. The following groups are comprised in the Western Alps: The Maritime Alps, near the Mediterranean coast; the Cottian Alps, stretching from Mont Chambeyron, 11,155 feet, to the Col de Fréjus. It contains two peaks exceeding 12,000 feet in height—Monte Viso 12,609 feet, and Viso di Vallante, 12,048 feet. West of it is the small group known as Oisans, or Dauphiné Alps, with Mont Pelvoux, 12,970 feet, and Pointe des Ecrins, 13,462 feet, the highest peak. The Graian Alps are the northernmost group of the Western Alps; here are Grand Paradis, 13,324 feet; Mont Pourri, 12,428 feet; La Grivola, 13,028 feet; the Grands Coulvirs, 12,567 feet; the Grande Sassièrè, 12,323 feet; and, at the turning point of the range, Mont Blanc, 15,781 feet.

The Central Alps are subdivided into many groups, of which only the principal ones can be mentioned. The Bernese Alps separate the upper valley of the Rhone from the Aar and comprise many well-known peaks, among them the Jungfrau, 13,672 feet; Finsteraarhorn, 14,026 feet; Aletschhorn, 13,720 feet; Mönch, 13,465 feet; Eiger, 13,040 feet; Schreckorn, 13,385 feet, and Wetterhorn, 12,150 feet. This is one of the most rugged groups of the system, containing many peaks exceeding 12,000 feet in height and having many glaciers, one of which, the Aletsch, is the longest in the Alps. On the opposite side of the Rhone valley is another splendid range, the Pennine Alps, in which, grouped about Zermatt, are the Matterhorn or Mont Cervin, 14,780 feet; Weisshorn, 14,803 feet; Grand Combin, 14,164 feet; Lyskamm, 14,889 feet; Mischabel, 14,941 feet; and Monte Rosa, 15,217 feet. The St. Gothard Range stands at the sources of the Reuss, Rhine, and Ticino, separated on all sides by comparatively

ALPINE VEGETATION



SCENE IN THE ROCKY MOUNTAINS OF MONTANA. Alpine lake and meadow in foreground ; spruces and firs and perpetual snow in background.



MT. HOOD, OREGON, SHOWING OSCILLATIONS OF THE TIMBER LINE. The trees, mostly mountain pines and hemlocks, advance farther up on the ridges than in the valleys.

low passes. To the south and east of it, and to the northeast of the Pennine Alps, are the Lepontine Alps, through which from northwest to southeast extends the valley of the Ticino. Between the Aar and Reuss are the Emmenthal Alps, separated from the Alps of Uri on the east by the Brünig Pass. The Tödi chain continues the line of Bernese Alps northeastward, with Tödi, 11,887 feet. The Rhetian Alps stand about the headwaters of the Inn River and contain many fine peaks, exceeding 11,000 feet in height, while south of them is the splendid Bernina group, with Mont Bernina, 13,304 feet. Still farther south, on the south flank of the system and east of Lake Como, are the Alps of Bergamo. East of the Rhetian Alps are the Otzthal and Ortler Alps, with peaks rising above 12,000 feet, the Ortlerspitze being 12,800 feet.

The Eastern Alps are of less height than the other two groups and are broken into a great number of semi-detached groups and ranges; the North and South Tyrolean, Sarnthal, Dolomite, Venetian, Carnic, and Julian Alps, Hohe Tauern, Niedere Tauern, and the Salzburg, Styrian, and Austrian Limestone Alps. The Eastern Alps culminate in the Gross-Glockner, in the Hohe Tauern, on the borders of Tyrol, Carinthia, and Salzburg, which rises to a height of 12,457 feet, and from which descend glaciers almost rivaling those of the Swiss Alps.

The highest part of the Alpine system, as expressed by the altitude of its summits, is in the western part of the Central Alps, in the Bernese and Pennine groups, and about Mont Blanc. From this region the altitudes diminish eastward and southward. Owing to the broken character of the system, passes are numerous; many of them are comparatively low, and are utilized as routes for roads and railroads. Some of them have been used as routes of travel for many centuries.

—Passes and Routes. Owing to the broken nature of the ranges, the passes are frequent and good. A number of them were known to, and used by, the Romans. The chief of these were the Mont Genève (6083 feet), from Briançon to Césanne, and the Brenner (4495 feet), Innsbruck to Verona. The passage of the Western Alps is made by five principal roads: 1. The military road, La Corniche, a coast road at the foot of the Alps from Nice to Genoa, parallel to which a railway now runs. 2. The road over the Col-di-Tenda, between Nice and Cuneo, made in 1778; highest point, 6150 feet. A railway tunnels it. 3. The highroad over Mont Genève, connecting Provence and Dauphiné with Turin; highest point, 6100 feet. 4. The carriage road made by Napoleon in 1805, over Mont Cenis, connecting Savoy with Piedmont; highest point, 6850 feet. Near this the chain is pierced by the railway tunnel of Mont Cenis. 5. The pass of the Little St. Bernard, connecting Savoy and Piedmont; highest point, 7180 feet. The passage of the Central Alps is made by eight principal roads: 1. That of the Great St. Bernard, connecting the valley of the Rhone with Piedmont; highest point, 8120 feet. It was crossed by Napoleon in 1800. 2. The magnificent road over the Simplon, which mountain is pierced by the Simplon railway tunnel at a level below that of the St. Gothard tunnel, was constructed by Napoleon, 1801–06, and connects Valais with the confines of Piedmont and Lombardy; highest point, 6590 feet. 3. The pass of St. Gothard, connecting Lucerne with Lago Maggiore; highest point, 6936 feet.

One of the great Alpine railway tunnels is the St. Gothard. (See ST. GOTHARD.) 4. The San Bernardino Pass; highest point, 6770 feet. 5. The Splügen Pass, connecting the sources of the Rhine with the Adda; highest point, 6945 feet. This pass was the one used by the Romans in their intercourse with the countries bordering on the Danube and the Rhine and also by the German armies on their marches into Italy in the Middle Ages. 6. The Furka Pass, separating the heads of the Rhine and Rhone, and crossed by a wagon road at an altitude of 7992 feet. 7. The Stelvio Pass (Stilfser Joch), on the frontiers of Tyrol and Lombardy, traversed by the most elevated carriage road in Europe; its highest point, 9855 feet. 8. The Brenner Pass on the road from Innsbruck to Trent and Verona; highest point, 4495 feet. It is now crossed by a railway. Besides these great roads, leading south into Italy, there are two which lead north from the valley of the Rhone and cross the Bernese Alps, over the Grimsel Pass, 7103 feet high, and the Gemini Pass, 7640 feet high. Just east of the Gemini is the Lötschen Pass, tunneled by a railway. The roads over the Eastern Alps are much lower and also much more numerous than those in the Middle or Western Alps. The principal are: 1. The road from Venice to Salzburg, crossing the Noric Alps at an elevation of rather more than 5000 feet. 2. The road over the Carnic Alps, which divides into three branches—the first leading to Laibach, the second to the valley of the Isonzo, and the third to the valley of the Tagliamento. 3. The roads from the Danube at Linz to Laibach.

There are four railways crossing the Western and Central Alps: The Mont Cenis, connecting France with Italy; the St. Gothard, connecting Lake Lucerne with Lago Maggiore; the Simplon, from the upper Rhone Valley to Lago Maggiore, and the Brenner, from Munich and Innsbruck to Verona and Venice. The Arlberg railway, which pierces the Alps in the Arlberg tunnel, is the great highway between Switzerland and Austria. Besides these through lines there are many extending into the heart of the mountains. From the upper valley of the Aar many lines extend southward into the Bernese, Urner, and Glarner Alps to Interlaken, Lauterbrunnen, and Grindewald, and to Brienz, Meiringen, Lucerne, and Linthal. A railway passes up the Rhone valley, with a branch to Zermatt, in the Pennine Alps. On the Italian side several railways penetrate the mountains to considerable distances. The Eastern Alps are crossed by several railway lines, which subdivide and join, sending off many branches within the mountain area. Many of the points affording the grandest views in the Alps are now reached by mountain railways; the Gornegrat Railway, the highest railway in Europe, in the vicinity of the Matterhorn, climbing up to an elevation of 9908 feet. The most extensive panorama to be had from any easily accessible point is that obtained from the summit of the Rigi, a peak near Lucerne, less than 6000 feet high. As a pleasure ground for the lovers of grand scenery and adventurous mountain climbers, the Alps are the most attractive region on the earth. It is a truism that the most valuable of Switzerland's assets is the scenery of the Alps. Not that these are the finest mountains on the face of the globe, but there are no others comparable with them which are so accessible, and in which living and

travel are so pleasant and easy. Railways and carriage roads traverse these mountains in all directions. At the best scenic points are excellent hotels, and guides are provided for conducting visitors to all points. Hence every year tens of thousands of travelers visit the Alps from all parts of the civilized world.

Glaciers. As the Alps rise to heights of 12,000 to nearly 16,000 feet above the sea, in a region of ample rainfall, the precipitation on these mountains is great, and gives rise to extensive glaciers, which originate near the summits and descend to different levels, the longest reaching within four or five thousand feet of sea level, and one of them, the Lower Grindelwald, having its termination at an elevation of only 3550 feet. The principal glaciers are found in the Bernese and Pennine Alps and the group about Mont Blanc, although numerous smaller ones exist in many other parts of the system. The total number is estimated at 1200, of which 471 are in Switzerland and 462 in Austria, those in the former country being by far the largest, covering an area of 710 square miles; the total area of snow and ice in the Alps is about 1600 square miles. The area of one glacier in Alaska, the Muir, is 350 square miles, and it has 20 feeders greater than the Mer de Glace; while the largest and longest of the Swiss glaciers, the Aletsch, in the Bernese Alps, has a length of 16 miles (area, 50 square miles), and a breadth of ice of more than a mile. In length the Unteraar is next, with a length of 10.4 miles, followed by the Gorner in the Pennine Alps and the Viesch in the Bernese Alps, each of which is 9.4 miles in length. Other well-known glaciers are the Mer de Glace, above the Valley of Chamonix, Miage Glacier, which has its source on Mont Blanc, the Oberaar and the Unteraar, in the Bernese Alps, and the Rhone Glacier in the same group, near the Furka Pass.

Our present knowledge of glaciers, their origin, structure, flow, advance, recession, and the phenomena of erosion, has been largely derived from a study of these Alpine glaciers. The present glacial system is but the last remnant of a great ice sheet which once covered both flanks of the mountain system, descending to the plains and valleys on either side. As it shrank it left great rivers of ice, which carved mountain gorges and lake basins. (All glaciers of the northern hemisphere are now receding, and probably those of the southern hemisphere also.) The lake scenery of the Alps is unrivaled for beauty, grandeur, and diversity. The largest lakes include Geneva, draining into the river Rhone, Neuchâtel, Bienne, Thun, Brienz, Lucerne, Zug, Zürich, Constance, Como, Lugano, Garda, and Maggiore. In the high mountains are cirques at the heads of all gorges not now occupied by ice, with little lakelets surrounded by frowning semi-circular sweeps of cliffs, hanging valleys, and smooth-sided, U-shaped gorges, planed and polished, all bearing mute evidence of their glacial origin. Since the recession of the glaciers, the rivers in their turn have done a vast deal of erosion, but have not yet by any means effaced from the land the handwriting of the ice. The main Alpine region is drained on the north by the upper system of the Rhine, including the Reuss, Aar, and Thur, and by south branches of the Danube, including the Iller, Lech, Isar, Inn, and Enns; on the east by west branches of the middle Danube, including the Drave and Save; on the south by the upper Adriatic coast

streams, including the Tagliamento, Piave, Brenta, and Adige, and by the northern branches of the Po, including the Mincio, Oglio, Adda, Ticino, Sesia, and Dora Baltia; and on the west by the eastern tributaries of the lower Rhone, the Durance, Isère, and the upper Rhone itself.

Geology. The Alps are the result of intense folding and faulting of the strata, carried on for a long time, the folds and faults mainly trending northeast and southwest, accompanied and followed by long-continued and intense erosion by ice and water. The net result of the earth movements was greatly to elevate the surface in a broad anticline, composed of many sharp anticlines, synclines, and monoclines. Erosion has planed these off to a comparatively smooth curve, has removed the stratified beds in great part from the higher portions of the system, leaving only fragments of the older beds in limited localities, and has laid bare vast areas of the underlying gneissic rocks. Hence the higher parts of the system are composed almost entirely of gneissic and allied rocks, while upon the flanks are found stratified beds, lying in various positions with regard to the system, here lying up against it, there dipping away from it. The folding and faulting occurred in various geologic epochs, from Paleozoic times down, but was apparently most intense in relatively recent times, in the Mesozoic. They occurred at different times in different parts of the system, and not always or everywhere in the same direction, so that the result, in detail, is exceedingly complicated, and in some places in Switzerland mountain masses of different constitution are suddenly interpolated. These are called *Klippen*. The principal field of these movements, where the folding and faulting is most complicated and greatest, is north of the higher parts of the range, in other words, on the northern slope; here are found stratified beds succeeding each other in bewildering fashion. The southern or Italian slope is much simpler in structure.

Climate. The Alpine region is at the meeting place of the high middle-latitude marine climate of Western Europe, the continental climate of Central Europe, and the low-latitude marine climate of the Mediterranean regions. While it does not lie directly in the main path of the cyclonic disturbances which sweep across Northern Europe from west to east, yet it does lie within the sphere of influence of these storm centres. Moreover, during the spring, numerous extended cyclones pass over the Alpine region; but they are less frequent in the winter and fall, and are almost totally lacking in the summer. This is the chief reason for the steady cold of the Alpine winter, with but few intensely cold waves, the serenity of its summer climate, and the harshness of its spring weather. The average annual temperature on the northern Alpine boundary at altitudes of 1500 feet is about 48° F., while the seasonal averages range from about 30° F. in winter to 65° F. in summer. In winter temperatures usually descend as low as zero F., and in summer rise as high as 90° F. On the southern Alpine boundary, at altitudes of about 800 feet, the average temperature for the year is about 54° F., the variations ranging from 35° F. in winter to 72° F. in summer; but in winter the temperature usually does not descend below 15° F., and in summer may reach even 95° F. With increase of altitude above these regions there is on the average for the year a decrease in temperature of about 1° F.



ALPINE SCENERY
CHILLON AND THE DENT DU MIDI

for each 330 feet of altitude; but the rate of decrease is much more rapid in summer than in winter. The average daily temperature is remarkably uniform in the Alps; but the temperature changes from day to night are excessive, on account of the intense action of the sun by day and the rapid cooling by radiation by night, as in all elevated regions. The absolute humidity decreases with the altitude, and is greater in summer than in winter. The relative humidity, and, consequently, the degree of cloudiness, are least in winter in the Alps, while in the surrounding region the relative humidity and cloudiness are usually greatest in winter.

On the north side the annual rainfall is from 25 to 40 inches; but this increases irregularly to about 90 inches on the southern side, where the steep slopes deflect upward the moisture-laden warm winds from the Mediterranean Sea. The average annual rainfall for the whole region cannot be far from 60 inches, while that of the surrounding lowlands is less than 35 inches. Where the high mountains have a copious rainfall on the windward side, the valleys on the leeward side experience a deficiency; so that on one side of a mountain range the rainfall may be many times that on the other side. Of the total annual rainfall throughout the Alps about 18 per cent occurs in the spring and about 25 per cent in winter. In summer the proportion decreases from 37 per cent in the northern part to 25 per cent in the south; but in the fall, on the contrary, the proportion increases from 20 per cent in the north to 33 per cent in the south. In the higher Alps much of the precipitation is of course in the form of snow, which is carried down to lower levels by glaciers and is there melted. The snow line in the Alpine mountains undergoes an annual variation, reaching its lowest altitude, about 2000 feet, toward the end of January, and its highest altitude, in the neighborhood of 9500 feet, about the middle of August. The limit differs for the northern and southern exposures, the snow line on the southern slopes lying over 150 feet higher in mid-winter, and about 1300 feet higher in the early fall. At low altitudes of 2000 to 3000 feet, the snowy days much exceed the number of days on which the ground remains snow-covered, but at altitudes of 8000 feet, the first snow commonly remains throughout the season of snow. The lower limit of perpetual snow is at an altitude ranging from 8500 feet to 9500 feet.

The general winds of the Alps follow the cyclonic and anti-cyclonic laws, which give a veering through the south when the cyclones pass to the north, as they usually do, and through the north when the cyclones pass to the south. Local winds are very prevalent; among these the mountain and valley winds, blowing upward from the valleys by day and downward from the mountains by night, are the most characteristic. In the Central and Northern Alps occur these hot, dry winds called the föhn. These are the result of descending air on the leeward side of the mountains after much of the moisture has been condensed by the cold high up on the windward side. These föhn winds, while a source of discomfort to the inhabitants, are welcomed in the spring, for they clear the ground of snow much more rapidly than the sun can accomplish it. Such is the evaporating power of the föhn winds that it may cause two feet of snow to disappear in half a day.

Fauna. The large native animals of the Alps

are becoming scarcer and scarcer, by reason of the increasing number of sportsmen and the fact that the exploration habit, which is here practiced by tourists as in no other part of the world, has left scarcely a valley in untrodden seclusion. The wild cat, the brown bear, and the wolf have been driven into the more remote recesses, and are gradually becoming rare. The chamois and the ibex are found among the higher mountains, the haunts of the latter being among the inaccessible rocky solitudes bordering on the snow line. The pursuit of these animals is the most exciting and dangerous of European hunting sports. Foxes, weasels, and Alpine hares are plentiful, while otters and ermines are less numerous. The badger is common in the lower Alps, but the marmot is more distinctively an Alpine habitant, and it seems to maintain its numbers, and flourishes along with some smaller rodents in the higher altitudes even up to the snow line, the Alpine snow mouse having been found up to an altitude of 12,000 feet. The birds of the lower Alps are very numerous, consisting of the adjoining European species, and among the higher mountains are to be found eagles, hawks, and owls, and the smaller birds, choughs, snow finches, and larks. The great lammergeyer, once quite common in the higher Alps, has now become almost extinct. Game birds, such as woodcock, grouse, and partridges, are fairly abundant. Reptiles are not numerous. The lakes of the Alpine region contain a large variety of fishes; trout, salmon, and in some localities species of whitefish being the most important. Insects of all kinds flourish in the Alps. Butterflies and beetles are numerous, and extend up to snow altitudes. With increase of elevation, however, their colors become more and more subdued, and they become more and more deficient in wing power, thus necessitating a closer contact with the ground than prevails in like species below.

Flora. The forms of plant life of the Alps differ with the altitude, ranging from those common in Europe, at lat. 46°, to those typical of the arctic regions. The main subdivision of the Alpine plant growth is therefore into altitudinal zones; with increase of altitude there is a corresponding poleward change in the flora. The Alpine slopes are noted for their verdure up to the limits of vegetation; at low altitudes are the forests and meadows, while above these are the shrub and flower-decked pastures, which are such an important feature both in the landscape and in local life. At the base of the Alps on the south side, the lemon and olive flourish; but on the whole the prosperous growth of the vine may be taken as the most significant indication of plant life. With the grape occur the hardy plants of central Europe, grains, and the principal deciduous trees, oak, beech, ash, sycamore, maple, chestnut, and walnut. These latter are to be found up to an altitude of 4000 or 5000 feet, when they give way to the coniferous trees, which, while plentiful only up to an altitude of 6000 to 7000 feet, are in places found at still greater elevations, where the fir, the larch, and the creeping pine are the chief species seen, together with shrubs of central and northern Europe. The Alpine roses and violets are celebrated for their beauty. The typical Alpine plants, those which grow above the tree line, in some instances up to the region of eternal snow, are characterized by a low, clumpy growth which sends forth at the proper season flower stalks

which bear beautifully colored flowers. The blossoms of many species have peculiar hairy or woolly coatings. Gentians, violets, Alpine bells, edelrue, and the world-famed edelweiss are among the beautiful flowering plants of the region. Shrubs, such as the juniper, dwarf willow, and dwarf rhododendron, also occur in some places in profusion. Above the highest altitude of flowering plants and stunted shrub growth, from 10,000 to 12,000 feet, algæ, mosses, and lichens are the only vegetable life. There is not, however, a uniform flora at the same altitude in all parts of the Alpine region. Some species are indeed common in the appropriate climatic zone throughout the whole region; but, on the other hand, some species are limited to the west Alps, while others are peculiar to the north, south, or east Alps. Some of the arctic plants are so narrowly limited in distribution as to be found only on certain mountain groups.

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ALPUJARRAS, ăl'pōō-Hä'rās (Ar. *al*, the + *basharat*, herbage). A mountainous region in Andalusia, Spain, running parallel to the Sierra Nevada on its south side (Map: Spain, D 4). It is remarkable for its narrow, deep-cut, and romantic valleys, which are the most fertile in Spain. The inhabitants are in part of Moorish descent, large numbers of Moors having taken refuge here after the fall of the kingdom of Granada.

AL RAKIM, är'rä-kēm'. A name in the Koran (Sura xviii. 8), connected with the tale of the "Seven Sleepers." It is commonly understood to apply to the dog that guarded the "Sleepers" in their cave. But it has also been variously understood to mean the cave itself, or the valley wherein the cave was situated, or, again, the tablet set up over the entrance of the cave, enumerating the names of the slumbering occupants. See SEVEN SLEEPERS.

AL'REDUS, or **AL'FRED**. See ALFRED OF BEVERLEY.

ALSACE-LORRAINE, ăl'zās'lōr'rān' (Ger. *Elsass-Lothringen*; *Elsass*, ancient *Alsatia*, from the river *Ill* + Ger. *Sasse*, settler, tenant; *Lothringen*, the realm of Lothaire, grandson of Charlemagne). An imperial territory (*Reichsland*) occupying the southwestern end of the German Empire, and bounded by the Grand Duchy of Luxemburg, the Rhine province of Prussia, and the Rhine Palatinate on the north, Baden on the east, Switzerland on the south, and France on the west. Its area is 5603 square miles. Administratively it is divided into the districts of Upper Alsace, Lower Alsace, and Lorraine, the last being a fragment of the old Lorraine. Alsace is touched by the Rhine on the east and the Vosges Mountains are on the west border. The eastern part is an extensive plain, slightly inclined toward the Rhine, where it occasionally passes into swamps and marshes. The western part is traversed by the Vosges, which attain their greatest elevation in Alsace, the Sulzer Belchen (Ballon de Guebwiller) rising to a height of nearly 4700 feet above the sea. German Lorraine is a plateau region. The offshoots of the Jura where they enter Alsace are about 2500 feet high. Alsace-Lorraine belongs entirely to the basin of the Rhine. The Ill, a tributary of the latter, rises at the south end of Alsace and flows to the north throughout the greater part of its length. In the north, Alsace is watered by the Zorn, Moder, and a few other tributaries of the Rhine; while the western part of Lorraine is crossed by the Moselle.

The lakes are generally small, and furnish water for irrigation and water-power projects. The climate is mild, with a slight difference between the plains and the mountainous regions. The respective average summer temperatures of the two regions are 61° F. and 58°, and those for the winter 39° and 37°. Strassburg has an average yearly temperature of 50°, and Metz about 48.5°. Rainfall is abundant.

Agriculture. The soil of the country is well adapted for agriculture and is in some parts extremely fertile. The mountainous region is devoted almost exclusively to the cultivation of fruit and the vine, which grows as high as 1300 feet above the sea. The southern end of Upper Alsace is considered the most fertile part of the country, in contrast to the northern part of Lorraine, where the stony nature of the ground renders it unfit for agricultural purposes. About 48 per cent of the land is under tillage, over 30 per cent under forests, nearly 13 per cent in meadows, and about 2.3 per cent in vineyards. The land is divided into very small holdings, only about 2 per cent of the total area being in estates of over 50 acres each. Wheat, rye, barley, and oats are the chief grains. Potatoes and sugar beets, as well as hay and hops, are produced in large quantities. The cultivation of tobacco is still very important, although it has been declining of late. The cultivation of the vine is carried on more extensively than in any other section of the German Empire. Alsace produces chiefly white wines, while Lorraine yields exclusively red wines. The value of the output in 1911 was 34,900,000 marks, of which nearly one-half, or nearly one-tenth of the value produced in the Empire, was credited to Lower Alsace. The forests of Alsace-Lorraine consist largely of foliaceous trees, and are owned to a considerable extent by the communities.

Mining. Alsace-Lorraine occupies at present the first rank among the iron-producing countries of the German Empire. The growth of iron mining has been very rapid for the last decade, and, while in 1892 the production of iron ore in Prussia exceeded the output of Alsace-Lorraine by about 500,000 metric tons, in 1911 the latter produced 17,754,571 tons against Prussia's 4,948,711. The centre of iron mining is at the western end of Lorraine, near the frontier of Luxemburg, where the highlands on the left bank of the Moselle contain vast deposits of iron and some phosphate. Coal is mined principally in the Vosges; the output in 1911 was 3,033,436 tons. The output of salt is considerable (60,790 tons in 1911).

Manufactures. Among the manufacturing industries of Alsace-Lorraine the production of textiles occupies the chief place, employing about one-third of the total population engaged in industrial pursuits. Cotton weaving has been carried on extensively in Alsace-Lorraine since the middle of the eighteenth century and is at present considered the most important among the manufacturing industries. The production of textiles is carried on chiefly at Mülhausen, Kolmar, and along the numerous streams, which are utilized largely for industrial purposes. The production of woolens and yarns is very extensively developed in Lower Alsace. Linen and silk weaving establishments are also numerous. The production of textiles is still to some extent a house industry, especially in Lower Alsace. The iron and steel industry is next to the textile in importance. There are extensive

foundries, machine shops, tool factories, and numerous other plants for the production of various iron products. The value of the annual output of the mills and foundries is about \$40,000,000. Breweries and distilleries are numerous, but supply chiefly local demand.

Transportation and Trade. The transportation facilities of the Reichsland are not behind its industries. There are over 5000 miles of highways, nearly one mile of road to one square mile of territory. Of railway it had in 1912 1305 miles, or nearly 22.3 miles for every 100 square miles of territory, about the same as in the State of Illinois. The canal system of Alsace-Lorraine is one of the best in the Empire, and the government expends large sums on its maintenance and constant extension.

Government. Alsace-Lorraine was established as a part of the German Empire by the law of June 9, 1871; from that year the chief executive head has been the German Emperor, acting through the Statthalter, his appointee, at Strassburg. The constitution of the Empire was extended to the Reichsland Jan. 1, 1874, and on October 29 following a provincial committee (elected indirectly), the *Landesausschuss*, was established. This body was abolished by the constitution of May 31, 1911. Under the constitution the legislative power rests with the Emperor and a diet of two chambers. The First Chamber consists of representatives of the religious bodies, of the four larger cities, of their chambers of commerce, of the agricultural councils, of the trades union, etc., and of members named by the Emperor in number (18 in 1913) not exceeding the rest of the members. All hold office for five years. The Second Chamber consists of 60 deputies elected for five years by general suffrage, direct and secret. The Statthalter is assisted by a ministry. The districts of Upper and Lower Alsace and Lorraine are administered by presidents and councils. The Reichsland sends three members to the Bundesrat and 15 to the Reichstag. The revenue is obtained chiefly from direct and indirect taxes, customs, and state forests. The budget for 1912 balanced at 74,049,304 marks. The public schools are under the supervision of the school board, presided over by the Secretary of State. Since the German occupation the proportion of illiterates has diminished considerably. Education is still controlled to a considerable extent by the Church, over 27 per cent of the teaching staff consisting of clergymen and persons belonging to religious orders. Alsace-Lorraine contains one university, that of Strassburg. The population of Alsace-Lorraine in 1900 was 1,719,470, showing an increase of over 7 per cent since 1890; in 1905 it was 1,814,564, showing an increase of nearly 5.24 per cent since 1900; in 1910, 1,874,014 (Lower Alsace, 700,938; Upper Alsace, 517,865; Lorraine, 655,911). In 1910 Roman Catholics numbered 1,428,343; Protestants, 408,274; other Christians, 3868; Jews, 30,483; others, 3046. Of the total 965,625 were male and 908,389 female. Strassburg, the capital, had 178,891 inhabitants.

History. Originally a part of Roman Gaul and inhabited by Celtic tribes, the region now known as Alsace was overrun by the Germanic nations during the fourth and fifth centuries and was ultimately brought under the dominion of the Franks. The Teutonic invaders supplanted, to a great extent, the old Celtic inhabitants, and by the tenth century the country

had become thoroughly Germanized. After the partition of the Frankish Empire, Alsace was held by the dukes of Swabia and later by the Hapsburgs, under whose rule it enjoyed prosperity. Rich and powerful towns, chief among them Strassburg and Kolmar, sprang up and attained, in the course of time, a very large degree of self-government, entering frequently into treaty relations with other cities of the Empire and partaking fully in the intellectual and spiritual life of the German people. Modern Lorraine, in the meantime, originally the nucleus of the independent nation of Lorraine, had become steadily more and more French. A part of the possessions of the Duke of Burgundy, its autonomous position tended to disappear; until finally Henry II invaded the country, seizing Metz, Verdun, and Loué. Alsace next became the object of French ambition. In the Peace of Westphalia, in 1648, the Hapsburgs (as rulers of Austria) ceded their territories in Alsace to France. Louis XIV subsequently seized the numerous free cities of Alsace. Kolmar was incorporated with France in 1680 and Strassburg in 1681. The Treaty of Ryswick (1697) confirmed France in possession of Alsace.

Systematic attempts to assimilate the inhabitants, who were mainly of Germanic stock, with the French were made by the government, but met with no success until the Revolution, when, in the general overthrow of feudalism, Germans and French were drawn together by the common ideal of democracy. The French spirit penetrated deeply into the upper and middle classes, and even the mass of the population was reconciled to French rule. When war, therefore, between France and Prussia broke out in 1870, those natives of Alsace who did not side zealously with France remained neutral. In Lorraine occurred some of the most decisive battles of the war, Gravelotte and Vionville and the siege of Metz. The surrender of Alsace and a part of Lorraine was made the principal condition of peace by Prince Bismarck, who acted in this as the exponent of a widespread spirit in Germany, which demanded the recovery of the ancient Germanic borderland. Alsace (with the exception of the district of Belfort), and the part of Lorraine where the French language had not supplanted the German, became a part of the newly founded Empire, and were put under the direct control of the Emperor. The attempt to win back the people to German influences was greatly hampered by the vehement opposition of the Gallicized upper classes and the clergy, and the civil administration was brought almost to a standstill for a number of years by the refusal of the men elected to the district and provincial councils to take the oath of loyalty and perform their functions; the representatives to the Reichsrath were, for the most part, French irreconcilables. In 1872 the German government called upon the inhabitants to declare themselves either German citizens or French. More than 150,000 expressed their adherence to France, and of these nearly 50,000 removed across the border. On the part of the German authorities a policy of severity approaching military rule was tried in alternation with one of mildness and concession, and for a long time both proved equally ineffective. The Germanization of the provinces has steadily been aimed at, however, in acts making the study of the German language compulsory in the public schools, and the use of it obligatory in the

courts and legislative bodies; in the suppression of French radical newspapers, and in the establishment of higher schools of learning under German control. After 1890 the prospect of an ultimate reconciliation became brighter; a loyalist party appeared which wielded some influence in the elections. The status of Alsace-Lorraine, however, is still far from settled. A great number of the inhabitants yet hope to become reunited to France, while others urge that Alsace-Lorraine should become a republic like Switzerland, with its neutrality recognized by international agreement. In December, 1913, the situation was more critical than ever, owing to the stern suppression of an anti-Prussian demonstration, giving rise to a parliamentary crisis of serious proportions.

Consult: H. Witte, *Zur Geschichte des Deutschthums im Elsass und im Vogesenengebiet* (Strassburg, 1897); Gerber, *La condition de L'Alsace-Lorraine dans l'Empire Allemand* (Lille, 1906); H. Derichsweiler, *Geschichte Lothringens* (Wiesbaden, 1901).

ALSA'TIA. The popular name of Whitefriars, London, which served early in the seventeenth century as a refuge for criminals—a reservation which was abolished by Parliament in 1697. See the account in Scott's *Fortunes of Nigel*.

ALSBERG, ălz'bĕrg, CARL LUCAS (1877—). An American chemist, born in New York City. His father, Meinhard Alsberg, was one of the founders of the New York Chemical Society, which subsequently grew into the present American Chemical Society. Carl Alsberg graduated from Columbia College in 1896, then studied medicine in Columbia University, receiving the degrees of M.D. and M.A. in 1900. The three following years he spent in Germany, devoting himself to physiology, pharmacology, and chemistry under Hofmeister, Emil Fischer, and others. From 1902 to 1908 he was connected with the Harvard Medical School, acting as head of the department of biochemistry from 1905 to 1908. In the latter year he was appointed chemical biologist in charge of the Poisonous Plant laboratory in the Bureau of Plant Industry at Washington, and in 1912 President Taft chose him to succeed Harvey W. Wiley (q.v.) as Chief of the Bureau of Chemistry in the United States Department of Agriculture. He has published a number of original studies on the chemistry of the nucleic acids and the proteins, on the value of sea foods, phosphoric acid metabolism, poisonous plants, and enzymes.

ALSEA. A tribe of Indians near the mouth of the Alsea River, Oreg., now reduced to a few individuals. See YAKONAN.

ALSEN, ăl'zen (Dan. *Als*). An island in the Baltic belonging to the Prussian province of Schleswig-Holstein and separated from the mainland by the Sound of Alsen, which in some parts is less than 400 yards wide (Map: Prussia, C 1). Its greatest length is nearly 20 miles, its greatest breadth about 12 miles, and its area is 124 square miles. The island is very picturesque in appearance, with a fertile soil. Its lakes have fish, and apples constitute an important article of commerce. The soil is fertile and yields grain. The chief towns are Sonderburg and Nordburg. The former is the capital, has a fine harbor, and is well fortified. Close to the harbor are the ruins of an old and famous castle, in which Christian II of Denmark and Norway was confined from 1532 to 1549. In the

war of 1864 Alsen was taken by the Prussians from the Danes. Pop., 1900, 2500.

AL SIRAT, ʔs sê-rät'. The bridge from this world to the Mohammedan paradise, as narrow as a razor's edge, on which the virtuous pass to paradise, while the wicked fall into hell; derived from the Zoroastrian idea of the Chinvat Bridge.

ALSOP, ʔl'söp, RICHARD (1761-1815). An American author, born in Middletown, Conn. Before he finished his course at Yale College, he went into business. His literary tastes caused him to join the "Hartford Wits," among whom were Theodore Dwight, Benjamin Trumbull, and Lemuel Hopkins, and later he became the principal contributor to the *Echo*, a satirical publication (1791-95; published in a volume, 1807). His works include a *Monody on the Death of Washington*, in heroic verse (1800); *The Enchanted Lake of the Fairy Morgana* (a translation of a portion of *Orlando Innamorato*, 1808); *The Natural and Civil History of Chile* (from the Italian of Molini, 1808); and the *Captivity and Adventures of J. R. Jewett among the Savages of Nootka Sound* (1815). Alsop was an accomplished linguist.

ALSTED, ʔl'stët, JOHANN HEINRICH (1588-1638). A German Protestant divine and voluminous writer, professor of philosophy and divinity at Herborn and Weissenburg. He was born near Herborn, and died at Weissenburg, Transylvania. Of his compilations may be mentioned his *Cursus Philosophici Encyclopædia*, which includes a treatise on the use and abuse of tobacco, particularly noteworthy from its date; *Thesaurus Chronologiæ*; and *De Mille Annis*. The latter was a prophecy that the millennium would commence in 1694.

AL'STRÆMÆRIA, or **ALSTRÖMER'S**, ʔl'strë-mërz, **LILY** (named after the Swedish botanist, Klas von Alströmer). A genus of South American plants of the family Amaryllidaceæ, which is distinguished by tuberous roots and by often having the outer segments of the perianth different in form from the inner. The leaves are twisted, so that what should be the upper surface becomes the lower. The species number about 60 and are natives of the warmer parts of America. Some are sufficiently hardy to endure the open air in England and as far north as Virginia in the United States and are admired ornaments of flower gardens. Some have climbing or twining stems. Among these is the *salsilla* (*Alstræmeria salsilla*), a plant of great beauty, with lanceolate leaves, a native of Peru, cultivated in the West Indies, the tubers of which are eaten like those of the potato. In Great Britain it requires the hothouse. *Alstræmeria ovata*, also a beautiful plant, with a slender, twining stem and ovate leaves, is cultivated in Chile for its tubers, which are used as food. It has been introduced into Great Britain, but its cultivation has made little progress. The tubers weigh from three to six ounces. A kind of arrowroot is also prepared in Chile from the succulent roots of *Alstræmeria pallida* and other species. One of the finest species for greenhouse growing is *Alstræmeria alba*.

ALSTRÖMER, ʔl'strë-mër, KLAS VON (1736-94). A Swedish naturalist. He had for his master and friend Linnæus, who named in his honor the genus *Alstræmeria*. He visited Spain and spent 15 months there in the mountains. Unfortunately the journal of his observations was burned. He also wrote a work on the breeding of fine-wooled sheep.

ALTABAN, ʔl'tä-bän, or **ALTASAN**, ʔl'tä-sän. A division of the Ifugao tribe which formerly inhabited the northwestern part of Nueva Vizcaya province, Luzon, Philippine Islands. They no longer exist as a separate group.

ALTAI (ʔl-ti') **MOUNTAINS** (Tatar, golden mountains, from *altun*, *altan*, golden; Chin. *keen-shan*, same meaning). A mountain range of Central Asia forming part of the elevated region on the borders of Siberia and the Chinese Empire. The name formerly had a much wider significance, and included the entire line of high lands from the Irtysh River to the Okhotsk Sea, which is composed of several structurally independent units; but it is now limited to the much smaller group lying on the borders of Mongolia, Sungaria, and Siberia, and between about 45° and 54° N. lat. The range has a general trend to the northwest and southeast, nearly at right angles to that of the larger system. The Altai Mountains begin on the southeast with the Ektag range (Greater Altai), in the region of the Gobi Desert, and for some distance they form the boundary between Mongolia and Sungaria. Toward the northwest the range increases in breadth by the converging of outlying mountains, and also in height, but after passing the Siberian frontier it gradually loses its massive character and fades out into the steppes. On the slopes of the Ektag are the sources of the Black Irtysh, Kobdo, and Urungu rivers. North of this range and across the valley of the Bukhara River are several mountainous groups which constitute the Northern Altai. The latter are arranged along an axis parallel to that of the Ektag range, and attain an extreme elevation of over 10,000 feet in Mount Byelukha ('White Mountain'). The Tarbagatai group, farther west, may also be included with the Altai range. This group begins in Sungaria and reaches across the Siberian frontier, where it is continued by the Tschungistan Mountains into the region of the Khirgis steppes. Geologically, the Altai consist of a central core of schists and granite broken through by intrusions of igneous rocks, with Paleozoic strata ranging from the Silurian into Carboniferous on the outer edges. As the mountains were formed by upheaval at an early geological period, they have been subjected to long-continued denudation and erosion. Their crests, of which only the highest rise above the snow line, are generally well rounded, and their slopes are covered with a rich growth of grass or with heavy forests of pine, cedar, and birch. Deer, hares, and wolves abound in the lower, and bears in the higher, portions of the range. The mountains are but thinly populated, except within the limits of the Russian Altai, where there is a well-developed mining industry.

ALTA'IC and **U'RAL ALTA'IC**. Terms used of a family of languages in parts of northern, eastern, and central Europe and the greater part of northern and eastern Asia, besides still other sections. See **URAL-ALTAIC** and **TURANIAN**.

ALTAMAHA, ʔl'tä-mä-hä'. A river formed by the confluence of the Oconee and Ocmulgee rivers, at the boundary line of Montgomery and Appling counties, Georgia. It flows to the southeast and empties into the sound of the same name, below Darien (Map: Georgia, E 4). It is 155 miles long, drains an area of 14,400 square miles, and is navigable for its entire length for boats drawing five feet of water.

ALTAMIRA, ʔl'tä-më'rá. A famous cavern

in northern Spain noted for its prehistoric paintings. See PALEOLITHIC PERIOD.

ALTAMIRA Y CREVEA, ä'l'tä-mē'rä ē krä'vâ-ä, RAFAEL. Contemporary Spanish critic and historian. Born at Alicante, 1866. After completing his law studies, he went to Madrid, where he collaborated on various political and professional newspapers and magazines and wrote several novels. Later he became professor in the *Institución Libre de Enseñanza* (one of the most influential educational institutions in Spain). For a while he was director of the Republican newspaper *La Justicia* and then was called to a professorship of law at the University of Oviedo. While at Oviedo he became interested in university extension, and it is largely owing to his indefatigable zeal that there is university extension in Spain to-day. Altamira became later Director-General of Primary Education in Spain and a member of the important *Junta para ampliación de estudios superiores*, also of the Hispanic Society of America, the Real Academia de Ciencias Morales y Políticas of his own country; and an officer in the Order of the Corona d'Italia.

Altamira has attained prominence as an orator, lecturer, and critic of art and history, and has made lecture tours to South America, the West Indies, and the United States. He is at present a correspondent of the *Revue Historique* at Paris and *The Athenæum* at London.

His published work includes the following important titles: *Historia de la propiedad comunal*; *De historia y arte*; *Psicología del pueblo español*; *Historia del derecho español*; and in French, *L'Enseignement des sciences sociales en Espagne*. The most notable work of Altamira is his *Historia de España, y de la civilización española* (Madrid, 1901-11), four volumes of which have already appeared. A fifth volume, in preparation, will probably complete the work.

AL'TAMONT. 1. A character in Rowe's play, *The Fair Penitent*; the husband of Calista, the heroine, and slayer of Lothario, who has seduced her. 2. In Thackeray's *Pendennis*, a name assumed by the convict Amory on his return; the father of Blanche Amory.

ALTAMONT, FREDERICK. In Scott's novel *The Pirate*, the assumed name of the pirate John Bunce.

ALTAMURA, ä'l'tä-mōō'rä. An episcopal city in the province of Bari, Italy, 60 miles northwest of Tarentum (Map: Italy, L 7). It is surrounded by walls and is situated at the foot of the Apennines. The magnificent cathedral was consecrated in 1231, under Frederick II, and, after a remodeling early in the fourteenth century, was poorly restored in 1860. The country produces oil, wine, grain, and cattle, and the fairs at Altamura are attended from far and near. Pop., 1881, 20,000; 1901, 22,729; 1911, 25,616.

AL'TAR (Lat. *altare* or *altar*, probably originally a high place, from *altus*, high). The place on which sacrifices were made or offerings laid or libations poured or some other act of worship performed. Altars were in use from the earliest times among all historic peoples. Some of those mentioned in the Old Testament are among the earliest of which descriptions are recorded.

The Ancient East. The oldest altars of the Babylonians which have been excavated are square heaps of sun-dried bricks, and Herodotus relates that their great altars were made of

(i.e., incased with) gold. The Assyrians built altars of limestone and alabaster. The British Museum has several highly decorated examples: one triangular, another oblong, with scrolls that call to mind the expression "horns of the altar," which is literally carried out in many Græco-Roman altars with ox-horns or ram-horns at the corners. The Egyptians seem to have used two varieties—a concave conical altar for incense or smaller offerings; and great cubical blocks of stone, decorated with carvings, for larger sacrifices. The Metropolitan Museum, New York, possesses an excellent example of the first variety in the basalt altar of King Chephren and of the second in the great granite altar from the pyramid temple of Amenemhat I. The Hebrews in earliest times erected altars of unhewn stone in places where Yahwe was supposed to have manifested himself. But when worship became centralized at Jerusalem, only two altars were permitted in the temple: 1. The Altar of Burnt Offerings, built of stone and covered with plates of brass, whence it is also called the "Brazen Altar." It was 20 cubits in length and breadth and 10 cubits high and stood in the court to the east of the temple proper. 2. The Altar of Incense, or the Golden Altar, constructed of cedar wood and covered with plates of beaten gold. It stood within the Temple and was only 1 cubit in length and width and 2 high. (See TEMPLE OF JERUSALEM.)

Greek and Roman Altars. The altar was primitively of two classes: Either (1) placed on some height and often nothing but a mound of earth or a heap of stones or of ashes; or else (2) the family altar connected with each dwelling, in front of the entrance. This was smaller, permanent, and more artistic. Then came the altars connected with temples, either in the outer air, in front of the temple steps, or within. The great public altars of Græco-Roman worship in historic times, at which whole hecatombs were sacrificed and great festivals held, developed into immense artistic monuments, as, for example, that of Hiero at Syracuse, that of Hera at Samos, of Apollo at Delphi, and of Zeus at Olympia; the last-named was 125 feet in circumference. The famous altar at Pergamum (see PERGAMUM, GREAT ALTAR OF), with sculptures representing the combat of the gods and the giants, was 40 feet high. Probably such altars and their platforms are derived from the early Pelasgic altars that stood on an immense three-stepped platform and were the one centre of worship, for the Pelasgians had few temples. The Romans also used such colossal and artistic altars, especially to consecrate imperial worship: there was one for Spain and one for Gaul (at Lyons), with an abundance of statuary and decoration, where the Spanish and Gallic councils met annually and proclaimed their political allegiance. The Altar of Peace, with its sculptured friezes, erected in honor of Augustus, at Rome, to celebrate the pacification of the world, was one of the artistic masterpieces of the Augustan reign. (See ARA PACIS.) Of the smaller altars and tables of offerings, hundreds were erected in every city, not only in connection with the temples, but also in shrines and chapels and throughout the streets: they are among the finest pieces of Græco-Roman decoration and are of all shapes—circular, polygonal, square, or oblong. Usually each was consecrated to a single god or hero. Of course, the use to which the altar was put influenced its form, according as

it was for incense or sacred fire, for libations, for fruits, flowers, or the like, or for bloody sacrifices.

Christian Altars. In the Christian Church the altar was quite different in its suggestions. All reminiscence of heathen altars was abhorrent. The marble sarcophagi in which were buried the bodies of martyrs in the catacombs were among the earliest altars, except, indeed, plain wooden tables which developed into marble slabs with one or more legs. For several centuries only a single altar was allowed in each church—none outside—and it was always erected over the relics of a martyr; later, under the monastic régime, when chapels dedicated to saints were added to the church plan, each had its own altar. As early as the fifth century, precious metals came into use for altars. In the Western Church the great variety of shape in pagan times was reduced to one—moderately oblong. The altar was placed in the axis of the church, in front of the chord of the apse, or in the middle of the transept, if there was one. Beneath it was the confession for the relics of the saint, which afterward developed into the crypt. Above it rose a tabernacle, canopy, or ciborium. The structure of the altar itself was rarely ornamented, though in Italy the faces were often inlaid with marbles and mosaics. Nevertheless the altar usually had a number of artistic accessories that must be mentioned to give an idea of its appearance. The *altar-front* or *frontal* was a decoration for the front and sometimes for the other sides of the altar, not merely when the structure was a slab supported on legs, but even when it was solid. It was sometimes in the shape of a rich hanging; sometimes it was a relief of gold, silver gilt, enamel or silver. Famous mediæval altar-fronts are that of the cathedral of Basel, now in Cluny Museum, Paris; the Pala d'oro (q.v.), in St. Mark's, Venice; in Sant' Ambrogio, Milan; in San Giacomo, Pistoia. The *altar-piece* is used as a decoration placed on top of the altar at the back, a custom that did not come into use until the Middle Ages, when the altar was made to face the people and not the apse and when altars against the wall were multiplied. Some altar-pieces, complements to the altar-fronts, were of precious metals, as in St. Mark's, Venice, and San Giacomo, Pistoia, but usually they were devotional pictures, preferably in the form of triptychs, or even groups of sculpture, or a sculptured tabernacle. (See PREDELLA.) The altar-piece was sometimes treated with great splendor of architecture, sculpture, painting, and carving, and made into an imposing architectural composition rising to a considerable height, as (especially) by the Germans and Flemings in the Late Gothic period, and by the Spaniards throughout the entire duration of the Spanish Renaissance. The *altar-screen* is often connected with the confession and its staircase. In early churches it was surmounted by sculpture and hardly distinguishable from an altar-rail.

In the Greek church the altar has retained its primeval simplicity. It is square in form, so that the clergy may pass around in administering the sacrament, and without wealth of decoration which is confined to the iconostasis (q.v.) in front of the altar. Since the Reformation the use of the altar in the Roman Catholic church has remained essentially the same. Although it has been retained by churches of

the Anglican and Lutheran communion, its use has been greatly modified and its importance diminished. It has given place to the simple communion table in the Reformed church, and with the non-liturgical Protestant denominations, such as Presbyterians, Congregationalists, Baptists, Methodists, etc., the use of the altar is of course conditioned by the mode of administering Holy Communion. (See COMMUNION IN BOTH KINDS; LORD'S SUPPER.) Consult Schmid, *Der christliche Altar und sein Schmuck* (Regensburg, 1871); Rohault de Fleury, *La Messe* (Paris, 1883); Thier, *Les principaux autels* (Paris, 1888); Lowrie, *Monuments of the Early Church* (New York, 1901); Gilbert Scott, *English Church Architecture* (London, 1881).

ALTAROCHE, ăl'tà'rôsh', MARIE MICHEL (1811-84). A French playwright and journalist, born at Issoire. From 1834 to 1848 he was editor-in-chief of *Charivari*, the influence of which was increased by his political satires and his general wit and acumen. He was elected to the Assembly in 1848, but retired the following year and from that time was successively manager of the Odéon, Folies Nouvelles, and other theatrical enterprises. He wrote *Chansons et vers politiques* (1835), *Contes démocratiques* (1837), *Aventures de Victor Augerol* (1838), and the following plays: *Lcstocq ou le retour de Sibérie* (1836) and *Le Corrégidor de Pampe-lune* (1843).

ALTAZ'IMUTH (*altitude* + *azimuth*; see AZIMUTH). An astronomical instrument, used for determining the position on the sky of stars or other heavenly bodies by measuring their altitude and azimuth (qq.v.). The altazimuth instrument has two brass circles—one with its plane horizontal, the other with its plane vertical—and a telescope is attached to the circles. When this is directed so that a star appears at the intersection of a pair of crossed threads fixed in the field of view, it is possible to read the star's altitude and azimuth from the graduations engraved on the two circles. Being of considerable complexity, the instrument does not give results of a precision quite equal to those obtained with the meridian circle; and for this reason it is employed chiefly in its portable form when observations must be made at temporary observatories, such as eclipse expedition stations. It is in use, however, at Greenwich, for observing the moon on nights when it is not possible to observe that body in the meridian.

ALTDORF, ält'dôrf, or **ALTORF**. The capital of the Swiss canton of Uri, situated in a sheltered spot at the base of the Grunberg, about 2 miles east of the Lake of Lucerne (Map: Switzerland, C 2). It lies 1518 feet above sea level, and is a well-built town, having a church, a nunnery, and a Capuchin monastery, which was built in 1581 and which is the oldest in Switzerland. The town is connected with the Tell legend—for Tell is said to have lived at Bürglen, which is near by—and Tell dramas are played here by the citizens. The spot where his son stood to be shot at is marked by a bronze statue of father and child, by Kissling, erected in 1895. Southeast about 1½ miles is the entrance to the Schächenthal. Pop., 1900, 3147; 1910, 3837.

ALTDORFER, ält'dôr-fër, ALBRECHT (?1480-1538). A German painter, architect, and engraver on copper and wood. The exact date and place of his birth are unknown, though the latter was probably near Landshut; but

most of his life was passed at Regensburg, where he filled important civic positions as life member of the outer and later of the inner council, attained wealth, and where he died Feb. 13, 1538. He was influenced to some extent by Dürer, but is of independent importance, being chief master of the so-called "Danube" style and founder of a school. His pictures are marked especially by romantic imagination, his landscapes, which constitute the most important part of his work as a painter, being rather the creation of his own fancy than faithful transcripts of nature. But while his drawing is frequently disappointing, his coloring is rich and strong. One of his best-known works, the "Victory of Alexander at Arbela" (1529), so captivated Napoleon that it was carried off to Paris and only restored in 1815 to the Pinakothek at Munich, where are also his "Susanna's Bath" (1526) and others. Among important examples of his art in the Berlin Museum are "Repose on the Flight to Egypt," "Beggary Sitting on the Train of Pride," and a "Nativity." Others are at Augsburg, Nuremberg, Regensburg, and Vienna. His work on copper, of which over 100 examples remain, entitles him to a place among the "little masters"; and he was also a practicing architect, who held the office of city architect to Regensburg. Consult Friedlander, *Albrecht Altdorfer* (Leipzig, 1891); Voss, *Meister der Graphik*, iii (Leipzig, 1910).

ALTEA, äl-tā'á. A seaport town of Valencia, Spain, in the province of Alicante, 25 miles northeast of Alicante (Map: Spain, E 3). It stands on a rising ground at the head of the bay of Altea, is known for its exports of raisins, and has a lighthouse. Pop., 1900, 6179.

ALTEN, äl'ten. A portion of the province of Finmarken, in northern Norway, surrounding the Altenfjord. It consists of fertile tracts, where, in spite of the high latitude, much grain is grown.

ALTEN, äl'ten, KARL AUGUST, Count of (1764-1840). A celebrated Hanoverian general in the Napoleonic wars. He entered the army in 1781 and gained distinction at Valenciennes and Hondschooten. He was First Lieutenant in 1800, but after the capitulation at Lauenburg went to England, where he was made commander of a battalion in the German Legion (1803). In 1808 he assisted as General of Brigade in covering the retreat of General Moore to Corunna. In 1811 he took part under General Beresford in the siege of Badajoz and the battle of Albuera, and in the following year was promoted by the Duke of Wellington. In almost all the engagements of the Spanish war of liberation—at Salamanca, Vitoria, in the Pyrenees, Nivelle, Nive, Orthez, Toulouse—Alten took a prominent part. At Waterloo he held La Haye-Sainte for hours against the French. He commanded the Hanoverian contingent of the army of occupation in France (1818) and after his return to Hanover was made Minister of War.

ALTENA, äl'tā-ná. A town of Westphalia, Prussia, in the district of Arnsberg, on the Lenne, 40 miles northeast of Cologne (Map: Prussia, B 3). The town possesses a war monument, several churches, and the ancestral castle of the old Counts von der Mark. Its principal manufactures consist of iron, copper, brass, and nickel goods, one of its specialties being metal ecclesiastical vessels. Pop., 1900, 12,800; 1905, 13,594; 1910, 14,579.

ALTENBURG, äl'ten-burk. The capital of

the German duchy of Saxe-Altenburg, situated in a fertile country in lat. 50° 59' N., and long. 12° 25' E., about 24 miles south of Leipzig, near the river Pleisse (Map: Germany, E 3). It is the home of the Duke of Saxe-Altenburg. Pre-eminent among the noteworthy buildings is the ducal castle, built upon an almost perpendicular porphyry rock and celebrated as the scene of the abduction, in 1455, of the two Saxon princes, Albert and Ernest. A curious building is the so-called Rothen-Spitzen, composed of two connected towers, containing the State archives. Altenburg possesses several excellent educational institutions, a museum, a picture gallery, and a theatre. The card-game "Skat" originated among the well-to-do peasants of this region. The benevolent institutions include an infirmary and a hospital for poor citizens. Brushes, gloves, hats, playing cards, and cigars are among the chief manufactures, and it has a considerable trade in woolen yarn and produces much grain. Pop., 1890, about 31,000; 1905, 38,818; 1910, 39,977.

ALTENDORF, äl'ten-dōrf. Formerly a commune in Rhenish Prussia; since 1901, a suburban district of Essen, comprising the towns and villages of Kronenberg, Schederhof, Alfredshof, Bochelt, and Vogelheim. At the time of the incorporation it had a population of 63,271. Altendorf is liberally supplied with schools, one of the largest being that of the famous Krupp iron works, which are located here. In addition to the iron industry, Altendorf has extensive coke, brick, and cement works.

ALTENESSEN, äl'ten-ēs'sen. A city in the Prussian Rhine province, about 2 miles north of Essen, of which it is a suburb. It has important coal mines and machine works. Pop., 1890, about 18,000; 1905, 33,421; 1910, 40,672.

ALTENSTEIN, äl'ten-stīn. A castle in the duchy of Saxe-Meiningen, near the watering place of Liebenstein, and about 13 miles southeast of Eisenach, on the south slope of the Thüringerwald. It is the summer residence of the reigning dukes. There is here a beautiful park containing a limestone cavern 600 feet long in which there is a subterranean lake. St. Boniface, "the apostle of Germany," lived and preached here from 724 to 727; and near by is the place, marked by a monument, where, in 1521, Luther, while returning from Worms, was seized and carried off to the Wartburg.

ALTENSTEIN, KARL, BARON VON STEIN ZUM (1770-1840). A Prussian statesman. He was born at Ansbach and studied at Erlangen and Göttingen. After the Treaty of Tilsit he became the head of the finance department. In 1815 he went to Paris with Wilhelm von Humboldt to claim the restoration of works of art taken from Prussia by the French armies. He was Minister of Public Worship and Education during 1817-38 and did great service for the universities and schools. Under his direction the University of Bonn was founded and a great number of gymnasiums were opened. He drew up the education law of 1819, which is still the basis of public instruction in Germany.

AL'TERA'TION (from Lat. *alter*, other, different). In its most general sense, with reference to a written instrument or a property interest, alteration is such a change as, if effective, would result in substituting a different instrument or interest for the original. An alteration of an easement, as a right of way, consists in changing its course or boundaries.

An alteration of a written instrument consists in making any material change in its language or character, such as erasing, interlining, or adding terms, or removing a seal from a deed. An immaterial change does not come under the description of an alteration. At common law, the alteration of a written instrument avoided it as against a party not assenting thereto. In England it does not matter whether the alteration is made by a party or by a stranger. In this country a distinction is made between the two cases, and alteration by a stranger, or spoliation (q.v.), as well as alteration by a party through pure accident or innocent mistake does not invalidate the instrument, if its original language or tenor remains discoverable. The common-law rule rests upon considerations of public policy, its object being to deter the holder of a written instrument from tampering with it and to force him to carefully guard its integrity. By the Bills of Exchange Act in England and the Negotiable Instruments Law in several of our States, a holder in due course of an altered negotiable instrument may enforce it according to its original tenor. See the authorities referred to under CONTRACT; DEED; NEGOTIABLE INSTRUMENT.

ALTERATION, IN MUSIC. See MENSURABLE MUSIC, *Alteratio*.

AL'TERATIVE (Lat. *alter*, other, another, different). In medicine, a term applied to a remedy that acts slowly and in an unknown way, probably by promoting metabolism and improving the nutrition of the body. Alteratives may act on certain glands, or upon absorption in general; they are given in comparatively small doses, and for a considerable length of time. Mercury and iodine are examples of powerful alteratives, and their most effective action is seen in cases of syphilis.

Some preparations of arsenic are powerful alteratives in certain skin diseases. Cod liver oil (q.v.) is an alterative which is used with great benefit in tuberculous conditions, rickets, and other diseases associated with poor nutrition. Preparations of phosphorus have a powerful alterative action. Colchicine (q.v.) is said to act in this way in gout and subacute rheumatism. Sarsaparilla (q.v.) was formerly believed to possess strong alterative qualities, but it has been shown to be practically inert.

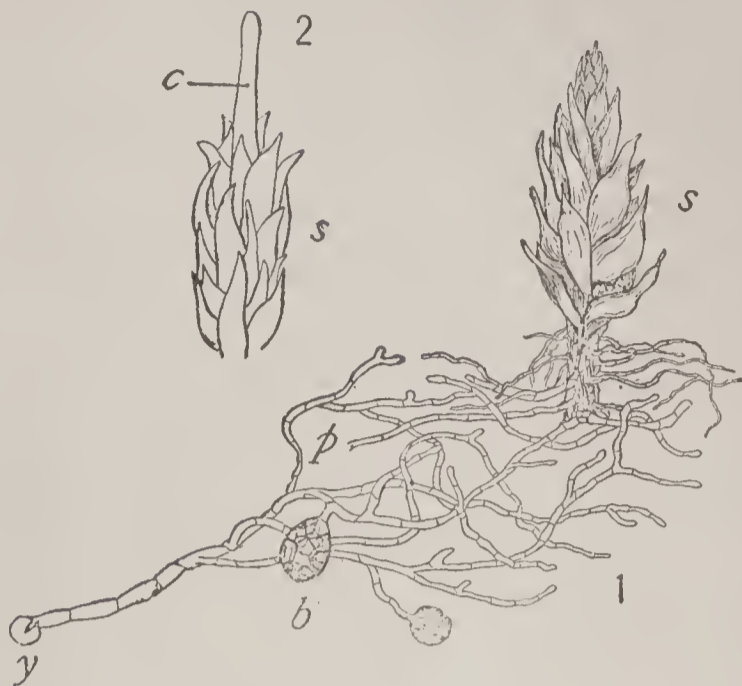
ALTER (äl'tēr) **FRITZ** (Ger. Old Fritz). A popular designation of Frederick the Great.

ALTERNATING (äl'tēr-nä'ting) **CURRENTS**. See ELECTRICITY; DYNAMO-ELECTRIC MACHINERY.

AL'TERNA'TION OF GEN'ERA'TIONS (Lat. *alternatio*, an interchange, from *alter*, other, and *generation* from *genus*, birth, descent, offspring). The successive occurrence in one life-cycle of two or more dissimilar forms; the process by which in its life history a plant or animal may pass through alternating phases that do not resemble one another, especially differing in being successively sexual and asexual. This phenomenon is very widespread among organisms, and assumes different characters in different groups of plants or animals.

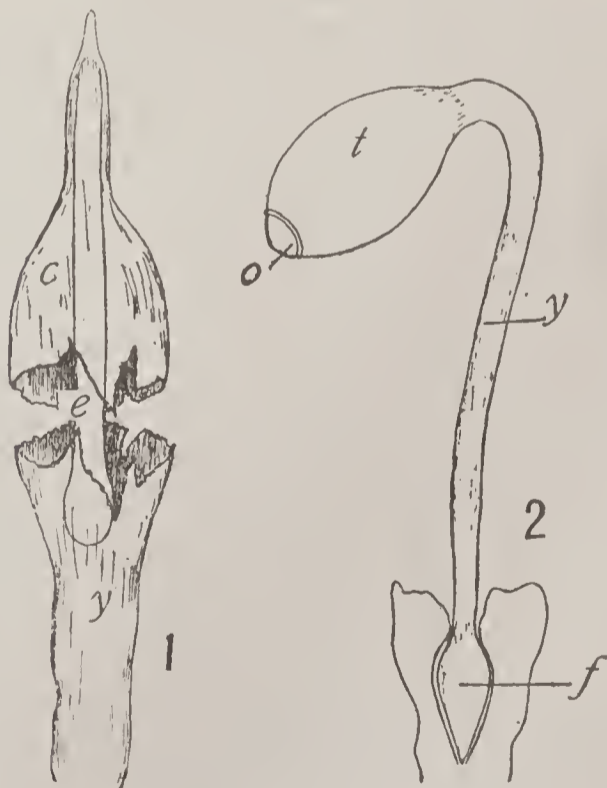
Among Plants. Alternation of generations is found in all forms of plants excepting the lowest. One may get some conception of alternation of generations in plants by comparing it with the very different alternation of forms which occurs in the life history of a moth or butterfly. In the plant, however, instead of having a series

of forms which pass into one another, our plant larva forms an egg which produces the mature form. If in the life history of a butterfly the larva should lay eggs and thus produce the mature forms, we should have something resem-



Life history of a moss: 1, the gametophyte, with the protonema (*p*) developed from an asexual spore (*y*), and giving rise to buds (*b*) that develop the leafy shoot (*s*); 2, the young sporophyte (*c*) rising above the leafy shoot (*s*).

bling the alternation of generations in plants. One of these generations has sex organs and hence is called the gametophyte; while the other generation has no sex organs and is known as the sporophyte. Both generations produce spores, but in a very different way. By means of its sex organs the gametophyte produces spores in a sexual way, i.e., by the fusion of two sex cells, and such spores are called in general oöspores, or fertilized eggs; while the sporophyte by ordinary cell division produces spores which are called asexual spores, meaning spores which have not been formed by sex organs. In the life history of the plant the fertilized egg



Sporophyte (sporogonium) of a moss: 1, the young sporophyte (*e*) rupturing the calyptra, carrying up the cap-like upper portion (*c*); 2, a mature sporophyte, showing imbedded foot (*f*), seta (*y*), capsule (*t*), and operculum (*o*).

of the gametophyte gives rise to the sporophyte, while the asexual spore of the sporophyte gives rise, in turn, to the gametophyte, and so the alternation continues.

Alternation of generations is first manifested

among the lowest plants (Thallophytes), but it is not established for all plants until the liverworts and mosses (Bryophytes) are reached. The phenomenon is still more apparent among the ferns and their allies (Pteridophytes); but among the seed plants (Spermatophytes), while evident to the laboratory student, it is well-nigh invisible to the ordinary observer. It is to mosses and ferns, therefore, that one must go for the clearest examples of alternation of generations.

In an ordinary moss the gametophyte consists of the well-known leafy moss plant, which bears sex organs at the tips of its main stem or branches. By means of these sex organs a fertilized egg (oöspore) is formed. When the fertilized egg germinates, it produces the sporophyte, which in this case consists of a more or less elongated stalk (seta) bearing at its summit a capsule or spore case. The leafless sporophyte is anchored in the leafy gametophyte by means of an organ called the foot. This peculiar sporophyte of the moss is commonly spoken of as the fruit, and when it appears upon the leafy plants these are said to be "in fruit." The spores formed in the spore cases are asexual and upon germination produce new leafy plants (gametophytes).

In the case of the ordinary ferns, which belong to the great group Pteridophytes, the same phenomenon may be observed, but with a striking difference. In the mosses the prominent leafy plant is the gametophyte, while in the fern the conspicuous leafy plant is the sporophyte. The gametophyte of the fern is a simple flat body (prothallium) resembling a minute liverwort. Upon this prothallium the sex organs are developed and the fertilized eggs are formed. From these fertilized eggs the comparatively large leafy fern body arises. This leafy body (the sporophyte) produces, usually upon the under side of the leaves, numerous asexual spores, which upon germination give rise again to simple gametophytes.

Among certain club mosses and other Pteridophytes the sporophyte produces two kinds of asexual spores. The most apparent difference between these spores is that of size, and hence they are called "microspores" (small spores) and "megaspores" (large spores). The microspore upon germination produces a male gametophyte, i.e., a gametophyte which bears only male organs. The megaspore upon germination produces a female gametophyte, i.e., a gametophyte which bears only female organs. The differentiation of spores is spoken of as "heterospory," and all the higher plants are heterosporous. With the appearance of heterospory the alternation of generations passes out of the reach of ordinary observation, since the gametophytes are so much reduced as seldom to leave the spores which produce them. In a seed plant, for example, the whole visible body of the tree, shrub, or herb is a sporophyte; the pollen grains are the small asexual spores or microspores, while the so-called embryo sac in the ovule is the large asexual spore or megaspore. The male gametophyte consists of only two or three cells, which form within the pollen grain. The female gametophyte consists of more numerous cells, but they are entirely confined within the megaspore walls and hence never leave the ovule.

Taking the plant kingdom as a whole, it may be said that in the lowest plants only a gametophyte exists. In higher forms a sporophyte be-

gins to appear, at first dependent upon the gametophyte, as in the mosses, but presently attaining independence and prominence, as in the ferns and seed plants. With the independence of the sporophyte, the gametophyte became gradually reduced in size, until in the highest plants it is visible only under the special technique of the laboratory. The significance of alternation of generations in the plant kingdom is by no means clear. One of its results, however, is to multiply the product of a single fertilized egg. If there were no alternation of generations, one fertilized egg would result in a single new plant. By the interposition of a sporophyte bearing numerous spores, each one of which may form a new gametophyte, a single fertilized egg may result in many new plants. Another result has been to assign different kinds of work to different individuals. Conditions that favor the dispersal of aerial spores are not consistent with those that favor fertilization (which results in the fertilized egg), and therefore it is of advantage to have spores and sex organs produced by different individuals. Since this conflict is most obvious in connection with land plants, it is believed that alternation of generations became universal in connection with the land habit.

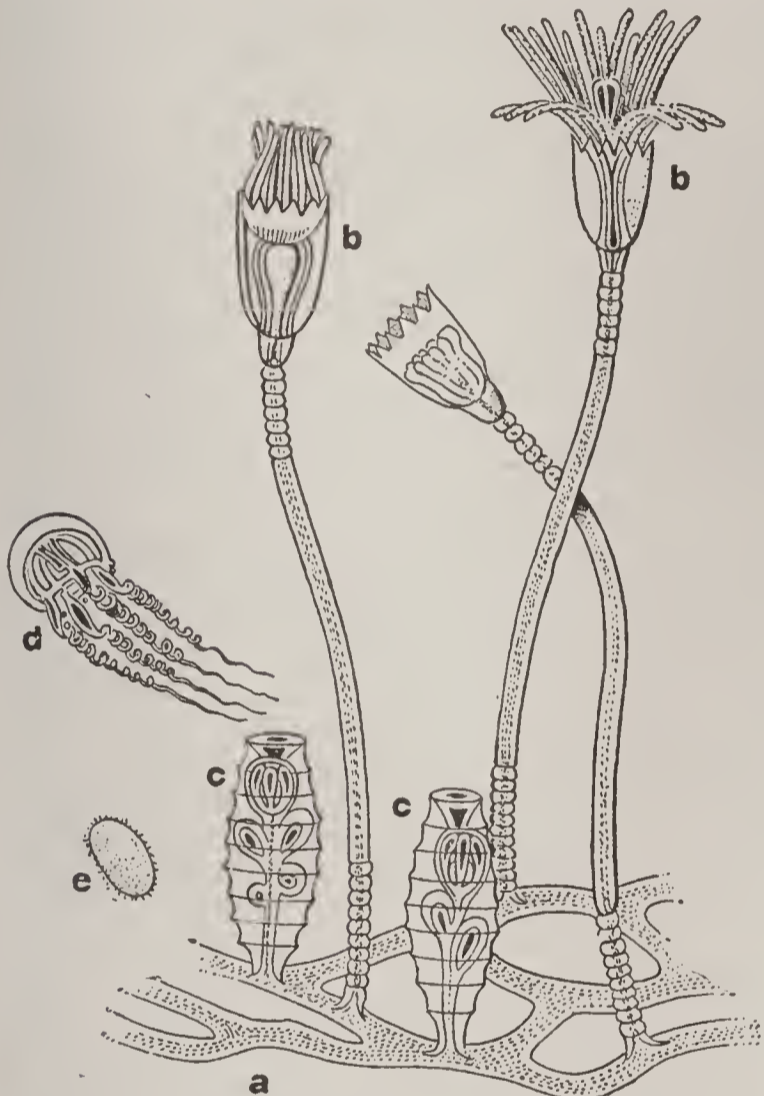
There is a cytological test for alternation that may be mentioned. The nucleus of each kind of plant has a definite number of chromosomes (q.v.). When fertilization occurs, which involves the fusion of two cells, the fertilized egg contains double the number of chromosomes contained by the egg or sperm, usually spoken of as the $2x$, or diploid number. Since the sporophyte arises from the fertilized egg, it is the $2x$, or diploid generation. When the sporophyte produces spores, a reduction in the number of chromosomes occurs, so that each spore contains the x number (haploid). Since the gametophyte is produced by the spore, it is the x or haploid generation. The sporophyte is begun, therefore, by doubling the chromosomes (fertilization), and the gametophyte is begun by reducing the number. It is obvious that a real alternation occurs whenever fertilization occurs. A fertilized egg always contains the $2x$ number, and although in many low plants it does not produce any structure that can be called a sporophyte and does produce directly another gametophyte, still the fertilized egg represents a sporophyte, because it is a $2x$ cell. Consult Coulter, Barnes, and Cowles, *Text-Book of Botany* (New York, 1910). See APOGAMY.

Among Animals. In the simplest case of alternation of generations among animals, the successive generations differ only slightly. Thus, in many butterflies having two broods during the year, the spring brood is unlike the fall brood; for example, in our "spring azure" the spring brood is of a violet color, and the fall brood is dark; both are sexual, but the spring and fall forms alternate in the series of generations. This form of alternation of generations is called *seasonal*.

The next example shows a greater difference between alternating generations. In a certain nematode (*Leptodera nigrovenosum*), both males and females are found living in pools of water or in damp earth. These pair, and the fertilized eggs develop into larvæ that enter into the bodies of aquatic animals and develop there as parasites, not as male and female individuals, but as hermaphrodites. These lay self-fertilized eggs,

which develop free as either males or females. Here a diœcious generation (A) alternates with an hermaphroditic generation (B). This kind of alternation of generations is called *heterogony*.

In a third form of alternation of generations eggs are produced, but the fertilization of the egg is omitted from alternate or even several successive generations; these are then followed by diœcious, sexual individuals. To this class belong many cases of parthenogenetically reproducing species; among flat-worms, trematodes; among crustacea, the Cladocera; and among insects, aphids, such as Phylloxera, Chermes, etc. In most of these cases there is a marked difference in form between the individuals of the diœcious and the parthenogenetically reproduc-



ALTERNATE GENERATION IN HYDROIDS.

A Campanularian Hydroid: *a*, root-stock (hydrorhiza); *b*, *b*, hydranths; *c*, *c*, gonangia, containing medusa buds; *d*, a free-swimming, gamete-producing medusa; *e*, ciliated larva before settling down.

ing generation. This class of cases is called *heterogenesis*. See HOP-LOUSE.

In the fourth form of alternation the fertilized egg develops into a generation (A) having a characteristic form, and capable of setting free neither eggs nor spermatozoa, but capable of forming buds. These buds develop into a new and different form of individual (generation B), which is diœcious and sets free zygotes, from which generation A is produced. There are numerous examples of this class among animals, e.g., among cœlenterates, the Hydrozoa and some Scyphozoa and Strobila; among flat-worms, certain cestodes (Echinococcus); among annelids, certain Syllidæ and aquatic Oligochæta; among tunicates, the Salpæ and Doliolidæ. This class of alternation of generations has been called *metagenesis*. As an example of it, one of the Hydrozoa may be taken. The free-swimming jellyfishes are diœcious and produce the male and female gametes, which unite in the water. The larvæ which result from the development of

the eggs settle down, become attached, and develop into a hydroid, which produces a colony by budding. Certain buds are set free as jellyfishes, and these in turn set free the gametes. Thus the hydroid form (A) and the jelly form (B) alternate with each other.

In certain respects the gamete-producing generation of spermatophytes among plants (see above) resembles the maturation period preceding the formation of gametes in the higher animals; and it has been suggested that even in vertebrates, including man, we have an alternation of generations: (1) the non-sexual generation beginning with fertilization and ending with the primary oöcyte or primary spermatoocyte; (2) the sexual generation beginning with the primary germ-cell and ending with the ripe germ-cell (two-cell division).

Bibliography. J. J. S. Steenstrup, *On the Alternation of Generations*, translated by Busk (London, 1845); J. V. Carus, *Zur nähern Kenntniss des Generationswechsels* (Leipzig, 1849); R. Leuckart, *Ueber den Polymorphismus der Individuen, etc.; ein Beitrag zur Lehre vom Generationswechsel* (Giessen, 1851).

AL'TERNA'TOR. See DYNAMO-ELECTRIC MACHINERY.

ALTGELD, ält'gëld, JOHN PETER (1847-1902). An American politician. He was born in Germany and was brought to the United States when an infant. His parents settled near Mansfield, Ohio. He entered the Union army at the age of 16 and served until the close of the war. He at first taught school, then studied law, and was admitted to the bar in 1869, his election as State Attorney of Andrew County, Mo., following in 1874. He was judge of the superior court of Chicago from 1886 to 1891, and Governor of Illinois from 1893 to 1897, in which capacity his pardon of the anarchists Fielden, Neebe, and Schwab excited wide comment. As a prominent advocate of free silver, he was an active supporter of William J. Bryan during the presidential campaigns of 1896 and 1900. He did much to advance the cause of prison reform and was a vigorous and effective public speaker. In 1890 his writings, *Our Penal Machinery and its Victims* and *Live Questions*, were published together.

ALTHÆ'A (Gk. ἀλθαία, *althaia*, wild or marsh mallow). A genus of plants of the family Malvaceæ, differing from the true mallow (*Malva*) chiefly in its six to nine bractlets (involucl) beneath the flower. The species (about 15), natives of Europe and Asia, and naturalized in North America, are annual and perennial shrubby plants that are much grown for their showy flowers. The more common species are the marsh-mallow (*Althæa officinalis*) and the hollyhock (*Althæa rosea*). The name *Althæa* is applied also by gardeners to the Rose of Sharon (*Hibiscus syriacus*). See HOLLYHOCK; MARSH-MALLOW; HIBISCUS.

ALTHÆA, or **ALTHEA** (Gk. ἄλθαία, *Althæa*). In Greek story, the mother of Meleager (q.v.). The Fates had told her that her son's life would last as long as a log of wood burning upon the hearth at his birth should be unconsumed. She quenched the fire and long preserved the log, but finally in anger at him set it on fire and so ended his life. She was the daughter of Thestius, wife of Cœneus, King of Calydon, and mother also of Tydeus and Deïanira.

ALTHE'A. In Richard Lovelace's *To Althea*

from *Prison, and Other Lyrics*, a poetical name applied to his love Lucasta, who is understood to have been Lucy Sacheverell.

ALT'HORN. See SAXHORN.

AL'THORP, LORD. See SPENCER, JOHN CHARLES.

ALTHU'SIUS, JOHANNES (1557-1638). Professor of law and ethics at Herborn. He published the first treatise on politics written in Germany. He made the basis of social life an express or implied contract between associated men, thus anticipating Rousseau's famous social contract theory. He defended resistance to usurpation of the rights of the people, from whom all rights proceed. He put combinations of workmen in the category of monopolies to be regulated. His chief works are: *Politica Methodice Digesta* (Herborn, 1603); *Jurisprudentiæ Romanæ Libri* (Herborn, 1588); *Dicæologica Libri Tres Totum et Universum Jus, quo Utimur, Methodice Complectantes* (Herborn, 1617). Consult Otto Gierke, *Johannes Althusius* (Breslau, 1880).

ALTIM'ETRY (Lat. *altus*, high + Gk. μέτρον, *metron*, measure). The art of ascertaining altitudes geometrically or measuring vertical angles by means of a quadrant, sextant, or theodolite. When used for this purpose, the instrument is known as an altimeter.

ALTIN, ălt-tin', **ALTYN-NOR** (Tatar *altun*, golden + *nor*, lake), or **TELETS LAKE.** A freshwater lake in the government of Tomsk, Siberia (Map: Asia, H 3). It is in the Altai Mountains, 1600 feet above sea level, is about 75 miles long, has an average breadth of about 20 miles, and is about 184 square miles in area. This lake is remarkable because in winter the northern part is frozen so as to bear sledges, while the southern part has never been known to freeze.

AL'TITUDE (Lat. *altitudo*, height, from *altus*, high, lofty). In astronomy, the elevation of a heavenly body above the horizon. It is measured not as a linear distance, but by the angle which a line drawn from the eye to the heavenly body makes with the horizontal line, or by the arc of a vertical circle intercepted between the body and the horizon. Altitudes are measured by means of a telescope attached to a graduated circle. (See **CIRCLE**.) The telescope being directed toward the body to be observed, the angle which it makes with the horizon is measured on the graduated circle. The altitude thus observed is the apparent altitude. To obtain the true altitude, corrections for refraction and the dip of the visible horizon below the true horizon must be applied to the apparent altitude. (See **HORIZON**.) In the case of the sun, moon, planets, a further correction for parallax must be made to obtain the true altitude, which is, in this case, sometimes called the geocentric altitude. The correct determination of altitudes is of vital importance in navigation. The sextant is the only astronomical instrument of precision that can be used without a fixed support on the deck of a rolling ship, and it is essentially an instrument for measuring altitudes. See **SEXTANT**; **ALTAZIMUTH**; **LATITUDE**.

ALTMAN, BENJAMIN (1840-1913). An American merchant, art-collector, and philanthropist, born and educated in New York City. Starting out first in his father's dry-goods store, and later in a small way for himself, he gradually built up a business, one of the most im-

portant of its kind in the world. As a philanthropist Mr. Altman did not become widely known, not because he did not give generously and wisely, but because he always gave without ostentation. But as a collector of great art treasures, chosen with the most fastidious taste, he came to have an international reputation, second only to that of J. Pierpont Morgan. This magnificent collection was found, after Mr. Altman's death, to have been willed, for the public benefit, to the Metropolitan Museum of Art (q.v.), the greatest single gift such an institution has ever received. The estimated value, more than \$15,000,000, is a mere guess; literally, the collection is priceless.

ALTMÜHL, ält'mұл (Ger. old mill). A river of Bavaria which rises at its western border, flows northeast through the Swabian Jura, and empties into the Danube between the towns of Ingolstadt and Ratisbon, and near Kelheim (Map: Bavaria, D 4). It is 100 miles long, and connected with the Regnitz, an affluent of the Main, by the Ludwigs-Kanal, thus establishing communication with the Rhine.

AL'TO. The deepest of the two principal species of voice found in women and boys. Its average range is from *g* to *c*². Originally the *cantus firmus* was given to the tenor (q.v.), against which a higher part, the *discantus*, was set contrapuntally. With the development of harmony a third part, the *contratenor*, was added, which sometimes was above, sometimes below, the tenor. Naturally the extended range demanded by the parts written for *contratenor* exceeded the natural compass of natural voices, and it was divided into two separate parts, the *contratenor altus* and *contratenor bassus*, whence the abbreviations *alto* and *basso*. In the sixteenth century the *contratenor altus* was sung by men with falsetto voices, as women were not permitted to sing in the church. In England this was also the general practice in the rendering of glees, and is not quite extinct to-day. Such male altos are called *alti naturali*. In Germany a distinction is made between *alto* and *contralto*, the latter denoting an exceptional range as low as *e* or even *d*. In English the two terms are used interchangeably. But in recent years a well-marked distinction has sprung up, employing the term "alto" for the vocal parts of a composition, whereas the term "contralto" designates the artist. In combination with another word, such as alto-trombone, alto-oboe, etc., it denotes an instrument of such a family with a lower range. For Alto Clef see **MUSICAL NOTATION**; **CLEFS**.

ALTON, ăl'ton. A city and railroad centre of Madison Co., Ill. It is picturesquely situated on limestone bluffs, 200 feet above the Mississippi River, which is spanned here by the great bridge of the Chicago, Burlington, and Quincy Railroad, 25 miles above St. Louis (Map: Illinois, B 5). Alton is on the Chicago and Alton, the New York Central, the Chicago, Peoria, and St. Louis, the Chicago, Burlington, and Quincy, the Wabash, the Missouri, Kansas, and Texas, and the Illinois Terminal railroads. Alton has a public library and a park, called Rock Spring Park. It is the seat of the State hospital for the insane, Shurtleff College (Baptist), organized 1827, the Monticello Female Seminary, the Western Military Academy, and the Ursuline Convent and Novitiate. The city is a commercial centre, manufacturing bottles, straw board, corrugated paper, cartridges,

powder, flour, tools, etc. Alton was settled in 1783, incorporated in 1835, and is governed by a charter granted under a general law of 1876. The mayor is elected for two years; the city council is made up of 14 members; and town meetings are held annually. Upper Alton (Pop., 1910, 2918) was annexed in 1911. The mayor appoints the school board and the heads of the police and fire departments, with the approval of the council. On Nov. 7, 1837, occurred here the famous anti-abolitionist riot, in which Elijah P. Lovejoy was killed and his printing office demolished. A monument has been erected to his memory. Other notable features are the Hayner Memorial Library and the city hall, scene of a Lincoln-Douglas debate. Pop., 1890, 10,294; 1900, 14,210; 1910, 17,528.

ALTON (al'ton) **LOCKE, TAILOR AND POET.** A novel by Charles Kingsley, published 1850.

ALTON, ä'l'tön, **JOHANN SAMUEL EDUARD D'** (1803-54). A German anatomist, son of the anatomist and archaeologist Joseph Wilhelm Eduard d'Alton. He studied medicine at Bonn and became professor of anatomy at the Academy of Arts in Berlin in 1827. In 1834 he was made professor of anatomy and physiology at Halle. His writings include *Handbuch der menschlichen Anatomie* (1848-50), *De Monstris Quibus Extremitates Superfluæ Suspensæ Sunt* (1853), and *De Monstrorum Duplicium Origine* (1849).

ALTONA, ä'l'tō-nā. The largest and richest city in the Prussian province of Schleswig-Holstein, situated on the right bank of the Elbe, its eastern boundary adjoining the Hamburg suburb of St. Pauli (Map: Prussia, C 2). From a commercial point of view, Altona forms one city with Hamburg. In 1888 it entered the German Customs Union. On account of its advantageous situation on the Elbe and railway connection with other German cities, its trade is of considerable importance and extends to England, France, the Mediterranean Sea, and the West Indies. There are many important industrial works in Altona; among others, cotton and woolen mills, iron foundries, glass works, breweries and distilleries, and establishments for the manufacture of chocolate, cigars, cotton, soap, leather ware, etc. Local transportation is afforded by numerous street-car lines, which also connect Altona with Hamburg. These are all in the hands of private corporations. The rise of Altona to its present importance has been recent and rapid for a Continental town. In 1880 its population was 91,049; in 1890 the suburbs of Bahrenfeld, Othmarschen, Ottensen, and Övelgönne were incorporated with Altona, and the total population was 143,249; in 1900, 161,507; in 1910, 172,533.

The streets of Altona are broad and for the most part regular, and well lighted by electricity. The city has only about 50 acres laid out in parks. This, however, does not include the suburbs. Among the notable buildings may be mentioned the Rathaus, the palace of justice, the custom house, and the city theatre. Among the objects of greatest interest in the city is the old cemetery of the Portuguese Jews.

The city's affairs are administered by a municipal council composed of 35 members, and an executive board composed of 9 members. (See **PRUSSIA, Government.**) The street-cleaning of Altona is a model of thoroughness.

The city owns its water works, containing a

filtering plant by means of which the water of the Elbe is purified for drinking purposes. The plant yields an annual profit of about \$90,000. Its system of sewers is practically similar to that of Hamburg. It has not as yet adopted the system of sewage farms, which has proved so successful in some of the German cities. The annual expense of drainage and sewerage is about \$12,000.

Altona has an organized fire department, which forms one of the chief items of expense in the city's budget, amounting annually to about \$44,000. Altona owns and operates its own gas works at a net profit of about \$75,000 annually. Its electric light plant is owned and operated by a private company, which pays the city 10 per cent of its receipts.

Among the charitable and benevolent institutions are a public poorhouse, an infirmary, insane asylum, a house of refuge for boys, one general hospital, two hospitals for children, and a lying-in hospital. Its educational institutions include a gymnasium, three high schools, several technical schools, 27 grammar schools, a school of navigation, and a museum.

Altona was settled in 1536, and rapidly developed into a prosperous commercial town. In 1640 it came under the rule of Denmark. Its trade suffered during the Napoleonic wars, but revived with peace. In 1866 it was annexed to Prussia. Consult Worrl, *Illustrierter durch Hamburg-Altona* (Leipzig, 1902).

ALTO-OBOE. See **ENGLISH HORN.**

ALTOONA, ä'l-tōō'nā. A city in Blair Co., Pa., 117 miles east of Pittsburgh, on the Pennsylvania Railroad (Map: Pennsylvania, C 3). It is at the eastern base of the Alleghenies (q.v.), between Allegheny Mountain and Brush Mountain, situated amid picturesque scenery at an elevation of 1180 feet. Altoona is a typical American railroad town, its industries centring principally in the immense shops of the Pennsylvania Railroad, which employ 16,000 operatives and have an extensive production of locomotives, passenger coaches, and freight cars. These are the largest railroad shops in the world. The city has a public library, two hospitals, 52 churches, and Lakemont Park. Of particular interest is the famous Horseshoe Bend on the main line of the Pennsylvania Railroad near the city. There are municipal water works, built in 1860 and acquired by the city in 1872. Altoona spends annually in maintenance and operation about \$565,000, the principal items of expense being \$280,000 for schools, \$35,000 for the fire department, \$97,000 for the water works, \$50,000 for the police department, and \$20,000 for municipal lighting. The city was founded in 1850 by the Pennsylvania Railroad Company, was incorporated as a borough in 1854, and was chartered as a city in 1868. The citizens of Altoona voted to adopt the commission form of government in 1914. The great railroad strike of 1877 caused considerable excitement, and troops were ordered out to protect the company's property. Pop., 1880, 19,710; 1890, 30,337; 1900, 38,973; 1910, 52,127.

ALTOONA, or **AL'LATOO'NA, PASS.** A pass near Allatoona, Ga., the scene, on Oct. 5, 1864, of one of the most hotly contested of the minor battles of the Civil War. In his operations about Atlanta General Sherman made Allatoona his secondary base, and stored there 1,000,000 rations of bread, which General Hood determined to capture, detailing Gen. S. G.

French for the enterprise. As soon as Sherman was aware of Hood's designs he ordered General Corse (q.v.), stationed at Rome, to move with the utmost speed to the assistance of the small garrison, to hold the place against all odds, until the arrival of reinforcements. Accordingly, with a force of less than 2000, he maintained the defense against some 4000 Confederates from nine in the morning until three in the afternoon, when General French, alarmed by the approach of Federal reinforcements, withdrew. The loss in killed, wounded, and missing was about 700 on each side. An interesting account is given by Ludlow, *The Battle of Allatoona Pass* (Detroit, 1891).

ALTORF, ält'ôrf. See **ALTDORF**.

ALTO-RILIEVO, ält'ô-rè-lyä'vô. A form of relief sculpture in which the figures project strongly, usually more than one-half their thickness, from the background. See **RELIEF SCULPTURE**.

ALTÖTTING, ält-ët'ing. A place of pilgrimage not far from the Inn, situated 41 miles southwest of Passau, in one of the most beautiful and fertile plains of Upper Bavaria. Multitudes of Catholics from Germany and Austria visit the ancient chapel containing a black wooden image of the Virgin (the Black Virgin), dating back to the eighth century, and great treasures of jewels, the hearts of Maximilian I and of many princes of the Bavarian family, are said to be interred there. In the Peter and Paul's Chapel lies the body of Count Tilly. Altötting was originally a *villa regia*, where several German emperors held their court. From 1838 to 1873 it was the headquarters of the Redemptorist Fathers, and at present is the site of a Capuchin monastery. Pop., 1910, 5408.

ALTRANSTÄDT, ält'rân-stët. A village in Saxony, 15 miles west of Leipzig (Map: Prussia, E 3). It is famous as the place where Augustus II, Elector of Saxony and King of Poland, concluded a treaty with King Charles XII of Sweden in 1706. Pop., 1900, 823.

ALTRICES (Lat. nom. pl. of *altrix*, a female nourisher). A term used in ornithology (opposed to *Precoces*) to designate birds whose young are hatched in a helpless condition and require the care of the parent birds. Such birds usually build some sort of nest, where the young remain for some time after hatching. The young are usually naked when hatched. Nearly all land birds (except most game birds), and some water birds, as herons, pelicans, etc., are altricial. See **BIRD**; **NIDIFICATION**.

ALTRINCHAM, ält'rîng-am. A market town of Cheshire, England, on Bowden Downs, 8 miles by rail southwest of Manchester (Map: England, D 3). It is situated on two railway lines and near the Bridgewater Canal, which has contributed greatly to its prosperity. It is a very neat and clean town, and on account of the salubrity of the air and near-by woods is a favorite residence of many of the merchants of Manchester. It has manufactures of artificial manures, cotton goods, linotype machines, and has an iron foundry; but the chief employment of its inhabitants is the raising of fruit and vegetables for the markets of Manchester. Altrincham was a prosperous town in the time of Edward I, from whom it received many privileges. Pop., 1901, 16,831; 1911, 17,816.

ALTRUISM, ält'rô-iz'm (It. *altrui*, of, to, or for others, from Lat. *alter*, another). A word first coined in French by Comte (*altru-*

isme), and introduced by his Positivist followers into English as the antonym of egoism or selfishness. It signifies consideration for others and a due regard for their feelings and interests. Altruism is regarded by Positivists as the crowning virtue, in the exercise of which the perfected individual will find not only his duty but his chief pleasure. The word is now used far beyond the circle of Positivists, sometimes quite loosely in the sense of action resulting in the welfare of others, whatever might be the motive; sometimes more strictly in the sense of conduct motivated by the desire for this welfare. It is only in this stricter application that the word has any significance for ethics. One of the most important problems of ethics is that concerning the relations between one's own interests and those of others, in so far as these interests enter as motives into conduct. There are two rival issues to the question. One school maintains that self-sacrifice is the supreme moral principle, the other champions self-assertion. This difference gives occasion to another use of the terms "altruism" and "egoism." The view that altruism is the highest moral motive is itself called altruism, just as the view that acknowledges the primacy of egoism among moral motives is itself called egoism. For the criticism of these two views and for bibliography, see **ETHICS**; **HEDONISM**; **UTILITARIANISM**.

ALTRUISTS, SOCIETY OF. See **COMMUNISTIC SOCIETIES**.

ALTSCHUL, ält'shool, ELIAS (1812-65). An Austrian physician of Jewish extraction. He was born at Prague and studied medicine, graduating at the University of Vienna in 1832. He became professor of medicine at the University of Prague in 1848, and in 1853 founded the first homœopathic magazine in Austria, under the title of *Monatsschrift für Theoretische und Praktische Homöopathie*. He introduced homœopathy at the University. His principal works are: *Dictionnaire de médecine oculaire* (2 vols., 1856); *Lehrbuch der Physiologischen Pharmacodynamik* (1850-52); *Das therapeutische Polaritätsgesetz* (1852).

ALTUS. A city and the county-seat of Jackson Co., Okla., 147 miles southwest of Oklahoma City, on the St. Louis and San Francisco, the Kansas City, Mexico, and Orient, and the Wichita Falls and Northwestern railroads (Map: Oklahoma, B 4). The industries of the city include flour, oil, and alfalfa mills. The county is adapted to truck farming and stock raising. The water works and electric light plant are owned by the municipality. Pop., 1900, 1927; 1910, 4821; 1913 (est.), 5200.

ALTWASSER, ält'väs-er. A town of Silesia, Prussia, 43 miles by rail southwest of Breslau. It has coal-mining industries and manufactures of machinery, porcelain, glass, and mirrors. Pop., 1900, 12,144; 1905, 15,267; 1910, 17,321.

ALT-ZABRZE, ält-zäb'zhe. See **ZABRZE**.

AL'UM (Lat. *alumen*, of unknown origin). A double salt consisting of a sulphate or selenate of the monovalent element or radicle, and a sulphate or selenate of a sesquioxide, that crystallizes in the isometric system with 24 molecules of water. The principal alums of commerce contain potassium, ammonium, or sodium, and the sesquioxide of aluminum.

Potassium alum is a white, astringent, saline compound, found native as *kalinite*. It is made by calcining carbonaceous shales, the residue

from which is digested with sulphuric acid, yielding aluminum sulphate; to this potassium sulphate is then added, the resulting crystals constituting the alum. Another method consists in dissolving the alumina derived from the minerals cryolite or bauxite in sulphuric acid and treating the solution with potash or ammonia.

Ammonium alum is found native as *tschermigite*, and is artificially made by combining ammonium sulphate with aluminum sulphate as previously described. The low cost of ammonium sulphate, obtained as a by-product in the manufacture of illuminating gas, has led to the substitution of this alum in commerce for potassium alum. The properties of the ammonium and potassium alums are similar, though the ammonium compound is less soluble in water.

Sodium alum is found native as *mendoxite* and is made by the combination of sodium sulphate with aluminum sulphate.

Alum is used as mordant in dyeing, to clarify liquors of various kinds and especially water, to precipitate sewage, to harden tallow, fats, and gypsum in the tanning of leather; the ammonium alum is used in the manufacture of baking powders. A potassium chromium sulphate, called *chrome alum*, and an iron aluminum sulphate called *iron alum*, are also used in the arts, especially as a mordant in dyeing and in tanning skins. Consult J. Gardner, *Acetic Acid, Vinegar, Alum, Ammonia, etc.* (Philadelphia, 1885).

ALU'MINA (from *alum*). Aluminum oxide, the most abundant of the earths. It is found native, nearly pure as bauxite and as corundum; with minute quantities of metallic oxides, as ruby, sapphire, Oriental amethyst, Oriental emerald, and Oriental topaz; and with considerable quantities of iron oxide, as emery. It is also found in combination with silica, as in many of the minerals of the feldspar group as well as in certain igneous rocks.

Alumina is known in two forms—a white, soft, pulverulent variety, and a colorless crystalline variety. It may be prepared in a pure state by heating potash alum with a solution of ammonium carbonate; the resulting aluminum hydrate is well washed, dried, and ignited, the residue being pure alumina. A comparatively pure alumina may also be obtained by heating ammonium alum until its volatile constituents are driven off. When alumina is precipitated from a solution containing some coloring matter, such as logwood, it carries down the color with the flocculent precipitate, forming colored insoluble salts called *lakes*. It is this property that has led to its extensive use as a mordant in dyeing. By fusion in the electric arc furnace, the soft, clay-like bauxite is transformed into an exceedingly hard material now much used as an abrasive under the name of *alundum*. Corundum, sapphire, and ruby have been made in Paris from alumina.

ALU'MINITE. A hydrous aluminum sulphate found in compact white masses, in beds of clay.

AL'UMIN'IUM, or **ALU'MINUM** (from Lat. *alumen*, alum). A metallic element, next to oxygen and silicon the most widely distributed. It is not found native, but in combination, chiefly as an oxide in the mineral corundum (ruby, sapphire, and emery); hydrated oxide in bauxite, hydrargillite and diaspore; hydrated phosphate in wavillite; hydrous sulphate in

combination with potash in alunite and in combination with oxygen and metals as aluminates, as in spinel, chrysoberyl, and gahnite. It also occurs as a silicate in various clays. Its chief ore is bauxite of which the United States produced, in 1911, 155,618 tons, valued at \$750,649, or \$4.82 per ton at the mines. France also produced approximately the same amount. The production from other countries is very small. Two new ores were reported in 1911, which will probably become important factors in the production. Extensive deposits of alunite (hydrous sulphate of alumina and potash) containing 37 per cent Al_2O_3 and 11.4 per cent K_2O are reported to exist in Utah and Colorado, and wavillite (phosphate and hydrate of alumina with water of crystallization), containing 38 per cent Al_2O_3 and 35.2 per cent P_2O_5 has been discovered in Georgia. The elementary nature of aluminium was recognized by Davy and others, but the metal was not isolated until 1828, when Wöhler succeeded in decomposing aluminium chloride by the action of potassium. Deville, in 1854, obtained the metal by electrolysis. Deville's experiments attracted the attention of Napoleon III, under whose patronage a metallurgical plant was established at Javelle, France. Ingots of the metal were exhibited at the World's Fair held in Paris, 1855. In 1886 Hamilton Y. Castner, of New York City, invented an important process for the reduction of aluminium, comprising an improved method of obtaining sodium, by which the price of that reducing agent was lowered from one dollar a pound to one-fourth that amount. He established a plant in Oldbury, England, and began the commercial production of aluminium. Meanwhile, Hall, of Pittsburgh, Pa., and Héroult and Minet abroad, perfected electrolytic methods for the reduction of aluminium. In Hall's process the alumina is held in solution by a molten fluoride bath, which is itself not decomposed by the electric current. The latter is conveyed to the melted solution by means of carbon cylinders placed in the bath for positive electrodes, a carbon-lined pot forming the negative electrode. The oxygen of the alumina goes off at the positive electrode as carbon dioxide, wearing away the carbon at the rate of nearly a pound of carbon to the pound of aluminium produced. The reduced metal settles at the bottom of the pot, which is easily tapped, yielding a metal of 99 per cent purity. The Pittsburgh Reduction Co. erected works for the reduction of aluminium by the Hall process in 1889 near Pittsburgh, and in 1895, taking advantage of the power obtained from the Falls, a large electrolytic plant at Niagara. Extensive litigation between the Electric Smelting and Aluminium Co. (Cowles) and the Pittsburgh Reduction Co. was compromised in 1903. In 1911 the only producer in the United States was the Aluminum Company of America. The Southern Aluminum Company began the erection of a plant in 1912 with a capacity of 5000 tons per year. The production of aluminum in the United States has increased with great rapidity. In 1886, the year of Castner's invention, the production was only 1.5 tons; in 1891, 75 tons; in 1896, 650 tons; in 1901, 3575 tons; in 1906, 7455 tons, and in 1911, 23,062 tons. The price has decreased almost in proportion to the increased production; in 1855 aluminum sold at \$90 per pound; in 1870, at \$12 per pound; in 1889, at \$2 per pound; in 1904, at 33 cents per pound,

and for 1911 the average price was 22 cents. The price during 1910 and 1911 varied from 19 to 24 cents, depending upon the supply and demand. Cheap power is essential to produce aluminum commercially.

Aluminium (sym. Al., at. wt. 27.11) is a white metal with a bluish tinge, is extremely malleable, and has a specific gravity of 2.56, which may be increased to 2.68 by rolling. In its tensile strength it ranks with cast iron, breaking at 15,000 pounds to 20,000 pounds per square inch, but in malleability and ductility it ranks with gold. Like gold and silver, it hardens in working, and rods and wire vary in strength from 26,000 pounds to 62,000 pounds per square inch. The electrical conductivity of aluminium is about 50, with copper at 90, and silver at 100; and its thermal conductivity is 38, with copper at 73.6, and silver at 100. It is also sonorous. Aluminium is a little softer than silver, but its ductility allows it to be drawn, punched, or spun into almost any form. It is practically non-tarnishable, but, strictly speaking, after long exposure to the atmosphere its polish becomes dulled by a very thin film of white oxide. Aluminium is not acted upon by hydrogen disulphide, carbon monoxide, carbon dioxide, or sulphurous acid. It is practically unaffected by common salt, either wet or dry, and hence by sea water. On the other hand, solutions of the caustic alkalis readily attack it, and hydrochloric acid is its natural solvent. Aluminium forms alloys with most of the metals. Those with copper, silver, and tin are much used on account of their color, hardness, and stability, and the ease with which they are worked. (See ALLOYS.) Those with copper are called aluminium bronzes, and those with silver are known as *tiers argent*. The lightness of metallic aluminium, subsequent to the improved processes for its manufacture, suggested its application as a substitute for iron, tin, or copper; but as yet it has failed to supersede any of these metals, on account of its high price and low tensile strength. It is largely used in the form of canteens, cups, and cooking utensils in the United States army; in the textile industry for imparting a brilliancy particularly adapted to ceremonial and theatrical costumes; for paper decorations; and in thin sheets to replace tin foil for wrapping tobacco and candy. For electrical conductors the objection has been its tensile strength, but this has been overcome by placing on the market a conductor composed of seven wires, the centre one of which is of steel with high tensile strength. This wire has been adopted by the Pacific Light and Power Company, and in 1911 a line 275 miles in length was erected from Los Angeles to the power plant; this line is the longest of its size in the world. In the form of alloys it is largely used in the construction of automobiles, balloons, and aëroplanes. In 1911 the British government constructed the framework of its new naval airship of duralium, which contains 91 per cent of aluminum and has a tensile strength of 25½ tons per square inch, about the same as mild steel.

Bibliography. J. W. Richards, *Aluminium: Its History, Occurrence, Properties, Metallurgy, and Applications, including its Alloys* (Baird & Co., Philadelphia, 1896); J. W. Langley and C. M. Hall, "The Properties of Aluminum, with some Information Relating to the Metal," *Transactions of the American Institute of Mining*

Engineers (New York, 1890); Minet, *The Production of Aluminum, and Its Industrial Use*. Translated, with additions, by L. Waldo (New York, 1905); "Mineral Resources of the United States for 1911," *United States Geological Survey*, p. 938. See BAUXITE; CRYOLITE.

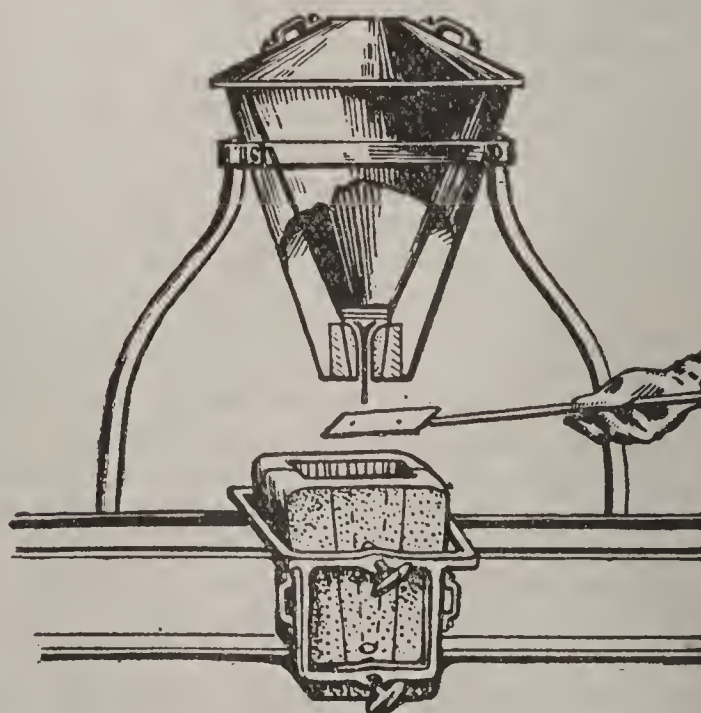
ALUMINO-THERMICS. A term applied to that branch of metallurgy in which the heat, developed by burning metallic aluminum, is utilized (1) to reduce other metals from their oxides, chlorides, or sulphides; (2) to raise the temperature of juxtaposed metals so that welding by pressure may be accomplished; or (3) to obtain molten iron for use in repairing broken iron and steel frames and shafts.

The principle of the reduction of metallic compounds by aluminum has long been known. Friedrich Wöhler, the discoverer of aluminum, tried in 1857 to produce metallic chromium from chromium chloride by means of metallic aluminum, and succeeded in making a chromium-aluminum alloy. The great difficulty in utilizing the reducing power of aluminum for practical purposes has been the fact that the reaction takes place only at very high temperatures and with explosive violence. Dr. Hans Goldschmidt of Essen, Germany, has succeeded in overcoming the practical difficulties and has evolved the "Goldschmidt process," which has found wide practical application in several departments of mechanical engineering.

The chemical reaction involved in this process is strongly exothermic, so that it is only necessary to start it at one point of the mixture, the heat thus liberated being sufficient to raise the adjacent parts to the temperature of reaction, and so on until the entire mixture has been acted upon. In order to start the reaction, a special ignition powder is used. The chemistry of the reaction is very simple and is shown by the following formula:



where M represents the metal to be reduced. In practice the metallic oxide, mixed with the proper proportion of powdered aluminum, is



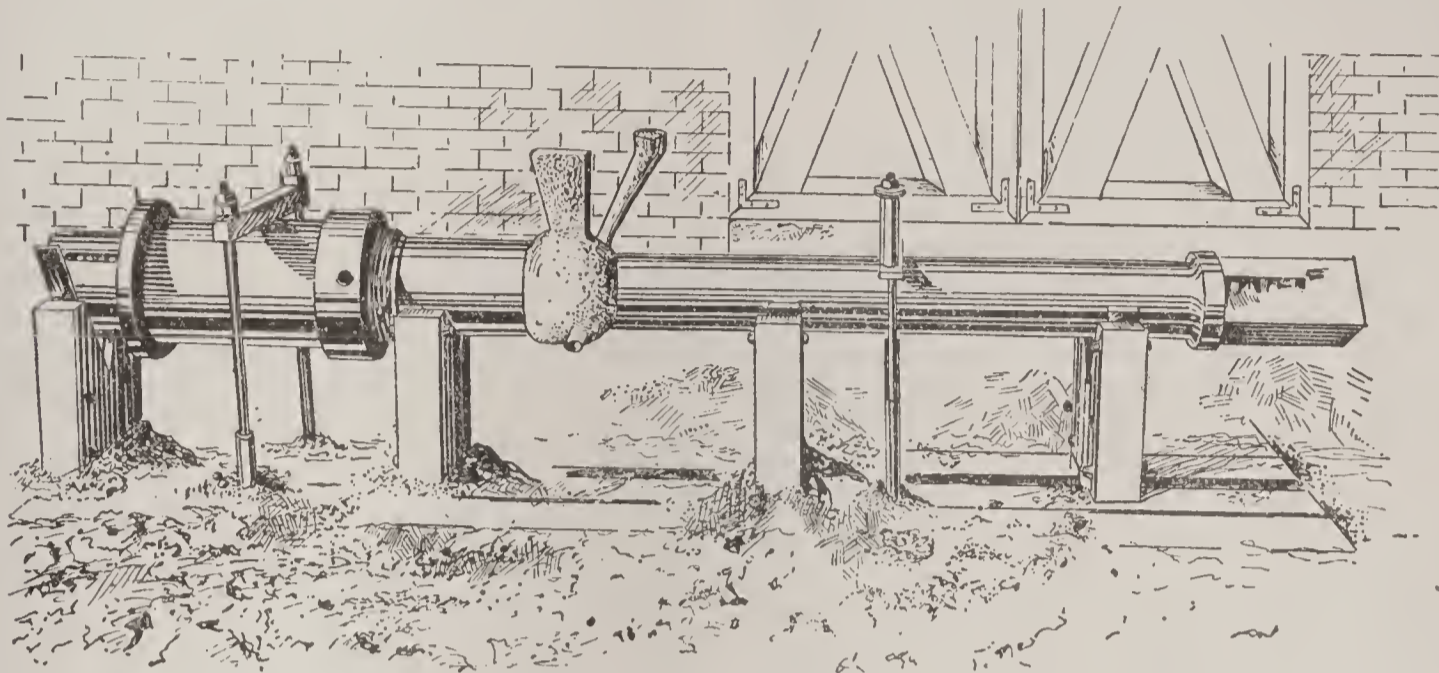
GOLDSCHMIDT PROCESS FOR RAIL-WELDING SHOWING CRUCIBLE AND MOLD.

placed in a base-lined vessel, and a small quantity of barium peroxide and powdered aluminum is laid on the top of the mixture. The reaction is started either by igniting this ignition powder

with a match or by touching a red-hot iron rod to it. In a few seconds the entire mass becomes white-hot and molten; the reduced metal collects at the bottom, and the molten aluminum oxide (artificial corundum) floats on top. The temperature of the molten mass has been estimated to be 3000° C. (over 5400° F.).

The Goldschmidt process is used to manufacture pure metallic chromium *absolutely free from carbon*. Made in the electric furnace or by reduction with carbon, chromium contains im-

in first, coats the interior of the mold and the outside of the pipes or rods with a protective coating which prevents the steel, flowing in afterward, from melting or sticking to either. The heat of the molten mass rapidly raises the temperature of the iron objects to the welding point, and set-screws force them together to form a butt-weld. As applied to repairing broken castings, the pieces are welded together by white-hot molten iron. The thermit is placed in a special crucible and the molten product



REPAIRING A SHAFT BY USE OF THERMIT.

purities and up to 12 per cent of carbon, which renders it useless for the manufacture of chrome steel. Manganese, also produced extremely pure by this process (up to 99 per cent of manganese), is used in the manufacture of special steels containing as much as 12 per cent of manganese, and as these steels are finding increased application the matter is one of some importance. The chief use of this carbon-free metal, however, is in making special brasses, bronzes, and other important alloys.

Probably the widest application of the Gold-



JOINING RAIL ENDS BY THE USE OF "THERMIT."

schmidt process is that of a mixture of iron oxide and aluminum, called "thermit," for repairing iron and steel objects by welding. As applied to welding iron pipes, rods, or similar objects, the ends, clamped against each other, are inclosed in a cast-iron mold. The thermit is then ignited in a flat-bottom crucible and the contents poured into the mold. The slag, going

poured directly on the iron pieces. The intense heat melts the surfaces of the solid pieces and causes them to become firmly cemented together by the solidifying molten metal. This result, called a fusion weld, is largely used for welding electric-traction girder-rails, where a continuous joint is desired for conductivity in order to diminish resistance. It is also used to repair broken gear-wheels, propeller and crank shafts, steamship stern-posts, connecting rods, locomotive frames, wheels, etc. The enormous advantage in repairing the objects in place is obvious, particularly in the case of steamships, where important repairs can be made without removing the parts. This is strikingly illustrated in repairing the stern-post, propeller blades, shafts, and other parts of a vessel directly accessible when the latter is in dry dock.

ALUMINUM BRONZE. See ALLOY, *Bronze*.

ALUM ROOT. A name given in the United States to two plants, very different from each other, but agreeing in the remarkable astringency of their roots. One of these, *Geranium maculatum* (see GERANIUM), very much resembles some of the species of *Geranium* which are common weeds in Great Britain. The root contains 12.27 per cent tannin, gallic acid, pectin, and red coloring matter. The tincture of the root is of use in sore throat and ulcerations of the mouth and is also administered in various diseases. The property of astringency belongs, in an inferior degree, to some other species of *Geranium* and of the kindred genera *Erodium* and *Pelargonium*. The other American plant to which the name alum root is given is *Heuchera americana*, of the family Saxifragaceæ (see SAXIFRAGE), an order in which also astringency is a prevalent property. The root of *Heuchera* is a powerful styptic and is used to make a wash for wounds and obstinate ulcers.

ALUM SHALE. A variety of shale or shaly sandstone containing iron pyrites, which on

weathering yields alum. In the process of weathering the pyrite decomposes, and the products of decomposition, reacting on the alumina of the shale, yield limonite and alum. The same process can be hastened by roasting the rock. Alum shales are found in many formations. For commercial purposes the shale is crushed and spread out for exposure to the weather or is roasted; but the industry is rapidly dying out, and is not carried on in the United States. An alum shale from England has the composition: silica, 51.16; iron sulphide, 8.50; iron protoxide, 6.11; alumina, 18.30; lime, 2.15; magnesia, .90; sulphuric acid, 2.5; carbon, 8.29; water, 2.00; total, 99.91.

ALUN'DUM. See ALUMINA.

AL'UNITE. A hydrated aluminum and potassium sulphate that crystallizes in the hexagonal system. In color it is usually white, although gray and reddish varieties are sometimes found. It occurs in seams in trachitic and allied rocks, where it has been formed as the result of the action of sulphurous vapors on the rock. This mineral, which is used as a source of alum, is found at Tolfa and Montioni in Italy, in Hungary, and elsewhere in Europe; also at various localities in the United States, especially in Custer Co., Colo.

ALUNNO, NICCOLÒ. See NICCOLÒ DA FOLIGNO.

AL'URED. See ALFRED OF BEVERLEY.

ALUTA, ǎ'ly-tǒ, or ALT, or OLT. An affluent of the Danube rising in the Carpathians, in Transylvania. After entering Rumania through the so-called Red Tower Pass of the Transylvanian Alps, it joins the Danube near Nicopolis (Map: Turkey in Europe, E 2). It is about 340 miles long and is unfit for navigation on account of the rapidity of its current.

ALVA. A city and the county-seat of Woods Co., Okla., 150 miles northwest of Oklahoma City, the State capital, situated at the north fork of the Canadian River, on the Atchison, Topeka, and Santa Fe, and the Chicago, Rock Island, and Pacific railroads (Map: Oklahoma, C 2). Alva is in an agricultural region, producing corn, alfalfa, wheat, oats, etc. The leading industries are flour milling, dairying, and the manufacture of brooms. Alva is the seat of the Northwestern State Normal School and has two fine school buildings, a hospital, a library, a city hall, a court house, and an opera house. It owns its water works. Pop., 1890, 1499; 1900, 2800; 1910, 3688.

ALVA, ǎl'vá, or **ALBA,** FERNANDO ALVAREZ DE TOLEDO, DUKE OF (1508-82 or 83). A Spanish general and statesman. His family was one of the most distinguished in Spain. He was trained by his grandfather for war and politics, entered upon a life of brilliant and intense activity, and became Prime Minister, and General of the armies of Spain under Charles V and Philip II. As a young man he fought in the campaigns of Charles V against Francis I, but his military talent was not thought highly of, and this hurt his pride. His appointment to high command was attributed to favor and influence rather than ability. He was in the campaign against the Elector John Frederick of Saxony, over whom he gained a brilliant victory at Mühlberg in 1547, and fought against Henry II of France and in the Italian campaign of 1555 against the combined French and papal forces, when he overran the States of the Church, but was instructed by Philip II, after the abdication of Charles V, to give up

his conquests. He acted as proxy for Philip at the French court when the Spanish King espoused Elizabeth, daughter of Henry II of France, after the peace of Cateau-Cambrésis in 1559. Alva is best known for his work in the Netherlands, where he was sent in 1567, with unlimited authority to repress the Dutch revolt against Spanish tyranny and the Inquisition. He promptly established the tribunal which has been known as the "Bloody Council." This body, without legal status or procedure, entered upon a general proscription of the living and the dead and the confiscation of property. Excessive taxation brought commerce almost to a standstill, and more than 120,000 Protestants emigrated. Counts Egmont and Hoorne were executed. Prince Louis of Orange was defeated, and Prince William was driven into Germany, after which Alva made a triumphal entry into Brussels, Dec. 22, 1568. He was especially honored by the Pope, and set up in Antwerp a statue of himself trampling on two figures, representing the nobles and people of the Netherlands. His bloodthirsty tyranny intensified the resistance of the Dutch, and after the destruction of his fleet the King recalled him at his own request (1573). He claimed to have caused the execution of 18,000 men. He was received in Madrid with the highest honors, but for an act of disobedience was banished from the court until called upon to conduct a campaign (1580) against Dom Antonio, of Portugal. The country was conquered and treated with that cruelty and license which always followed Alva's course. Alva was tall, spare, bronzed, with a long beard, a typical Spanish grandee. He was not, however, the bloodthirsty tyrant that Motley describes, and in one instance at least in the execution of Hoorne and Egmont, Alva long delayed action, writing to the King of Spain as he finally signed their death warrant that "it hurt him in his soul." Consult: J. L. Motley, *Rise of the Dutch Republic* (New York, 1836); P. J. Block, *History of the People of the Netherlands* (New York, 1900); Rustant, *Historia de Don Fernando Alvarez de Toledo, duque de Alva* (Madrid, 1751).

ALVARADO, ǎl'vá-rá'dó. A seaport in the State of Vera Cruz, Mexico, at the mouth of the Papaloapan River, 40 miles southeast of Vera Cruz (Map: Mexico, L 8). The harbor is well sheltered, but is too shallow for vessels of more than 13 feet draught. Nevertheless the town is a native trading post and a headquarters for steamers engaged in the coasting trade. The climate is very unhealthful because of the surrounding swamps. Its exports are rice and cacao. The inhabitants are engaged in fishing, principally, and the surrounding waters yield turtles, oysters, and crabs. Pop., 1910, 4347.

ALVARADO, ALONZO or ALFONSO DE (?-1554). A Spanish soldier of the sixteenth century. He was born at Burgos, served under Cortes in the conquest of Mexico, and under Pizarro in that of Peru. Sent to Chile in 1537 against the rebel Almagro, he was defeated at the Abancay River by Orgoñez. In 1548, under Gasca, he assisted in suppressing the revolt of Gonzalo Pizarro. He was appointed Captain-General of La Plata and Protosí, but was vanquished by the malcontent Giron in 1554 and died not long after.

ALVARADO, PEDRO DE (c.1486-1541). A Spanish adventurer, a companion of Cortes, and afterward conqueror of Guatemala. He was born

at Badajoz, in Spanish Estremadura. In 1510 he sailed for the New World, passing some time in the islands of Santo Domingo and Cuba. In 1518 he was dispatched from Cuba, by Velasquez, the Governor of that island, to explore, under the command of Grijalva, the shores of the American continent, when for the first time the Spaniards heard of the riches of Montezuma and of his vast empire. In February, 1519, Alvarado sailed with Cortes from Havana for the conquest of Mexico, in which Alvarado played a part second only to Cortes. His blue eyes and blond beard strengthened the impression among the dusky Aztecs that the invaders were "children of the sun," descendants of Quetzlcoatl, who were looked for to resume the dominion of the ancient royal house in Mexico. While he held the city of Mexico, during the absence of his chief, he massacred in the midst of a fête a great number of Aztec nobles. In the night retreat of July 1, 1520, the *noche triste*, Alvarado commanded the rear-guard and saved his life by a famous leap, the "salto de Alvarado," which he accomplished with the aid of his long spear across a wide breach in the causeway along which the retreating Spaniards were being driven. After the conquest of Mexico he was sent, in 1523, to subdue the tribes on the coast of the Pacific in the direction of Guatemala. He was completely successful and returned in 1527 to Spain, where the Emperor Charles V appointed him Governor of Guatemala. Pizarro and Almagro were then prosecuting a brilliant career of conquest in South America. Alvarado did not intend to intrude on their territories, but, as he considered the province of Quito to be without the limits of these, he landed with a force of five hundred soldiers at Bahía de los Caraques, whence he penetrated into the heart of the country, crossing the Andes by a bold and hazardous march. In the plain of Rio Bamba he was met by some of the troops of Pizarro, headed by Almagro, and agreed to retire on receiving an indemnity. Subsequently he received the government of Honduras in addition to Guatemala. He perished in an affray with the Indians near Guadalajara in western Mexico in 1541, crushed under his fallen horse. His greed for wealth led him to commit incredible acts of cruelty, that in the eyes of historians have overshadowed his military valor and talent.

ALVAREZ, ál'vá'râ', ALBERT RAYMOND (1861—). A French vocalist. He was born at Bordeaux. He was first in the army as a musical conductor; afterward he studied at the Conservatoire, Paris, and appeared as an operatic tenor. He first sang at the Paris Opéra in 1892 and soon became the leading tenor of the Opéra. In 1893 he appeared in Covent Garden, London. He visited the United States in 1898-99 and 1900. The unanimous approval which he met in Europe was not wholly confirmed in this country. His répertoire includes no less than 45 operas, in 11 of which he created the principal parts.

ALVAREZ, ál-vä'râth, DON JOSÉ (1768-1827). A Spanish sculptor, known also as Alvarez y Cubero. Born at Priego, he studied at the Academy of San Fernando, Madrid, at Paris, and under Canova at Rome. Refusing to recognize Joseph Bonaparte as King of Spain, he was imprisoned in Castle Sant' Angelo, Rome, but was released and employed by Napoleon in the decoration of the Quirinal Palace. Under Ferdinand VI he returned to Spain, was made sculptor to

the King in 1816, and director of the Academy of San Fernando in 1826. He was the chief Spanish representative of the so-called Classicist school of sculpture, the principal masters of which were Thorwaldsen and Canova. His works include statues of members of the royal family of Spain, a number of tombs of Spanish grandees, and several mythological figures and groups. The most celebrated of his works is a group in the Royal Museum of Madrid representing a scene from the siege of Saragossa.

ALVAREZ, JUAN (1790-1867). A Mexican general of Indian descent. He was born in Atoyac in the Mexican territory of Guerrero. He joined the revolutionary army in the war for Mexican independence. As a cavalry captain he distinguished himself in the battle of Tres Palos and in an assault on the fort of Acapulco, where he was wounded. He joined Santa Anna in the overthrow of the imperial government of Iturbide. He fought in the Mexican War with the United States in 1847, and he became the first Governor of the new State of Guerrero in 1849. Later he was one of the principal leaders in the successful revolt against the rule of Santa Anna. In September, 1855, he succeeded Carrera as President, but he became disgusted with the petty intrigues of his associates and resigned before the end of the year. Alvarez took up the fight for reform in the Three Years' War against the conservative reaction. He was one of the most determined opponents of Maximilian during the Second Empire in Mexico. Although many times a revolutionist, he had no selfish ambitions. His real interests were indicated by the various literary and scientific societies of which he was a member.

ALVARY, älvä'rè, MAX (1858-98). The stage name of a famous German dramatic tenor. He was born at Düsseldorf; his father was an eminent landscape painter, Andreas Achenbach. He studied singing with Lamperti and Julius Stockhausen of Frankfort, but owing to his father's opposition to his going on the stage, did not make his début until 1882, at Weimar, in *Stradella*. He came to this country in 1884, and made his first appearance as José in *Carmen* at the Metropolitan Opera House, New York. During his five years' engagement here he developed, partly under Seidl's guidance, into one of the greatest interpreters of Wagnerian rôles. His impersonation of *Siegfried* is still regarded as peerless. Alvary returned to America for the season of 1894-95 and again in 1896. March 21, 1895, at the Metropolitan Opera House, he sang *Siegfried* for the one hundredth time. In November, 1896, he was afflicted with cancer of the stomach, resulting, it is supposed, from bruises received by a fall through an open trap on the Mannheim stage. He went to his beautiful country-seat, Datenberg, the building of which, and his enforced absence from the stage, had impoverished him. Here he died, Nov. 8, 1898.

ALVENSLEBEN, älvëns-lä'ben, KONSTANTIN VON (1809-92). A Prussian General, born in Prussian Saxony. He was trained in the cadet corps, served through the Danish War and the war with Austria, and commanded the third army corps in the Franco-German War. He retired in 1873. A Prussian infantry regiment was named for him, as was also one of the forts at Metz.

AL'VERSTONE, LORD. See WEBSTER, SIR RICHARD.

ALVINCZY, ăl'vîn-tsê, JOSEPH, BARON VON (1735-1810). An Austrian field-marshal. He fought in the Seven Years' War at Torgau and Teplitz, and in 1789 he led the force which unsuccessfully attempted to capture Belgrade by storm. Between 1790 and 1793 he fought bravely in the Netherlands, and in 1796 was placed at the head of the Austrian forces in Italy. Here he was badly defeated by Napoleon, at Arcola and Rivoli. He became field-marshal in 1808.

AL'VIS (All-wise). In Norse mythology, the dwarf, a suitor for the hand of Thor's daughter, who answers Thor's questions in the lay (song) of Alvis.

AL'VORD, BENJAMIN (1813-84). An American soldier and writer. He was born at Rutland, Vt., and graduated at West Point in 1833. After serving in the second Seminole War (1835-37), and as mathematical instructor at West Point, he participated in the war with Mexico, and attained the brevet rank of major. During the march from Vera Cruz to Mexico he was chief of staff to Major Lally's column. He was paymaster of the department of Oregon from 1854 to 1862, and brigadier-general of volunteers from 1862 until his resignation of this grade in 1865. He was then brevetted brigadier-general in the regular army. He was paymaster at New York City till 1867, then in the district of Omaha, Neb., till 1872, and paymaster-general from 1872 until his retirement in 1881. Among his publications are *Tangencies of Circles and of Spheres* (1855) and *The Interpretation of Imaginary Roots in Questions of Maxima and Minima* (1860).

ALVORD, CLARENCE WALWORTH (1868—). An American scholar and educator, born in Greenfield, Mass. He graduated from Williams College in 1891, took post-graduate studies at the universities of Berlin, Chicago, and Illinois, and received the degree of Ph.D. from the last-named in 1908. After 10 years as a teacher in preparatory schools, he became (1901) instructor in history at the University of Illinois, assistant professor (1907), and associate professor (1909). In 1906 he was made special editor for the publications of the Illinois State Historical Society. An officer and member of many State and national historical societies, he contributed numerous articles to periodicals, and edited the *Cahokia Records* (1906); *Invitation sérieuse aux habitants des Illinois* (with Dr. C. E. Carter, 1908); *Governors' Letter Books* (with Dr. E. B. Greene, 1909); *Kaskaskia Records* (1909). In 1912, with Lee Bidgood, he wrote *First Explorations of the Trans-Alleghany Region by the Virginians*.

ALVORD, CORYDON A. (1812-74). An American printer. He was born at Winchester, Conn., and in 1845 removed to New York, where he became widely known as a printer of illustrated books. His establishment on Vandewater Street was one of the largest in the country. It contained fonts of old-style type and of ancient and Oriental letters which enabled him to make remarkable fac-similes of old texts. He was at one time president of the New York Typothetæ. After retiring from business in 1871 he removed to Hartford, where he prepared a history of Hartford and Winchester.

ALVORD, HENRY ELIJAH (1844-1904). An American soldier and authority on dairy matters, widely known as a writer and public speaker, and for many years prominently identi-

fied with agricultural education and experimentation. Enlisting in the Union army in 1862, he became a Major three years later. In the regular army he was a cavalry Captain (1866-72) and Chief Engineer on General Sheridan's staff (1868-69). Major Alvord was the first army officer to be detailed to an agricultural college as military instructor. Subsequently he became manager of the Houghton Farm Experiment Station, professor of agriculture in the Massachusetts and New Hampshire colleges, president of the Maryland College, and the first director of the Maryland Experiment Station. In connection with the "School of Farming" of the Chautauqua reading courses, he conducted what was probably the first correspondence course in agriculture in America. He was one of the founders of the Association of American Agricultural Colleges and Experiment Stations, serving as president in 1894-95, and was prominently identified with Federal legislation pertaining to agriculture. He was instrumental in organizing the first creamery east of the Hudson River, as well as many others in Massachusetts, Vermont, and Maine. He organized the Dairy Division of the United States Department of Agriculture in 1895 and remained its chief to his death. The American chapters of *Dairy Farming* (1881), as well as many agricultural monographs, were written by him.

ALWAR, ăl'wūr'. A feudatory state of Rajputana, British India (Map: India, C 3). Its area is 3221 square miles. Pop., 1911, 791,688.

ALWAR. Capital of the native Rajputana state of the same name, India, on the Northwestern Railway, 98 miles by rail from Delhi (Map: India, C 3). It is the residence of the Maharaja and of a British political agent. The town, dominated by an imposing fort 1200 feet above it, is picturesquely situated on undulating ground. Its chief building is the royal palace. Other noteworthy features are temples and tombs, and churches of the Roman Catholic and Presbyterian missions. At the time of the Diamond Jubilee of Queen Victoria, and to commemorate the event, there was founded here a school for young noblemen. The town has a fine water supply from the artificial Sili-ser Lake, 9 miles southwest of the city. Pop., 1901, 56,771; 1911, 41,305.

AL'WATO. See ANDREWS, STEPHEN PEARL.

AL'WOOD, WILLIAM BRADFORD (1859—). An American horticulturist, born in Delta, Ohio. He studied at Ohio State University (1884); Columbian (now George Washington) University (1886-88); the Royal Pomological School in Germany, and the Institut Pasteur in Paris. From 1882 to 1886 he was superintendent of the Ohio Agricultural Experiment Station, and for the two following years served as special agent of the United States Department of Agriculture. Except for the first three of the 16 years (1888-1904), during which he was vice-director of the Virginia Agricultural Experiment Station, he was also professor of horticulture and allied subjects at the Virginia Polytechnic Institute. During this period he carried on important investigations in horticulture and mycology. After being in charge of investigations into the fermentation of fruit products for the Government Bureau of Chemistry from 1900 to 1906, he was given the post of enological chemist. A model farm, on which he gave an example of what country life should be, became Alwood's

chief interest after his retirement from teaching. In 1900 he was vice-president of the International Congress on Agricultural Education, and in 1907 of the International Congress on Viticulture, both held in Paris. Several medals and decorations were conferred upon him by the French government and French agricultural societies. He wrote many pamphlets on horticultural subjects, on the chemical composition of apples and grapes, and on the composition of wines and ciders fermented with pure yeasts. Among the later of these is his *Enological Studies* (1912).

ALYATTES, ă'l'i-ăt'těz (Gk. Ἀλυάττης). A King of Lydia (c.618-560 B.C.). He took Smyrna, drove the Cimmerians from Asia, and extended the Lydian power to the river Halys. He also attacked Clazomenæ, but was repulsed. A six years' war was waged between him and Cyaxares, King of Media. He was succeeded by his son, Cræsus. His tomb, not far from Lake Gygæa, was one of the wonders of antiquity. Consult A. von Ölfers, *Ueber die lydischen Königsgräber bei Sardes* (1858).

AL'YPIN. A drug used for producing local anæsthesia, as a substitute for cocaine (q.v.). Its chemical makeup is denoted by the name monohydrochloride of benzoyletetrabutylammonium ethylisopropyl alcohol, and the formula $C_{16}H_{26}O_2 N_2HCl$. The substance occurs as a white crystalline powder, having a bitter taste, and freely soluble in water and alcohol. Its chief use is as a substitute for cocaine in spinal anæsthesia, being less toxic than the latter.

ALYP'IOS (c.360 A.D.). A Greek writer on music. He was born at Alexandria. His *Introduction to Music* (εἰσαγωγή μουσική) constitutes our chief source of information regarding the musical system of the ancient Greeks. (See GREEK MUSIC.) He discusses the art under seven headings: 1. Sounds; 2. Intervals; 3. Systems; 4. Modes; 5. Tones; 6. Alterations; 7. Composition, of which, however, only the chapter on Tones has been preserved. Of the other chapters not even fragments have come down to us. The treatise contains the 15 transposition scales in both vocal and instrumental notation in the diatonic, chromatic, and enharmonic systems. The work was first printed by Meursius in 1616. A critical edition was published in 1895 by Karl von Jan in the series *Musici scriptores græci*. A separate appendix, *Melodiarum reliquia*, containing all preserved Greek compositions, appeared in 1899.

ALYS'SUM (Gk. ἄλυσσον, *alysson*, a plant used to check hiccough, from ἄ, *a*, priv. + λύζειν, *lyzein*, to hiccough). A genus of low-growing, mostly perennial plants, of the family Cruciferae. There are many species and cultivated varieties, mostly of European origin. The flowers are small, white or yellow, and borne in racemes. The sweet alyssum (*Lobularia maritima*), grown in low borders, window gardens, baskets, and fenced-in greenhouses, is an annual.

ALZEY, ăl'tsī. An old city in Rhenish Hesse, on the Selz, 18 miles by rail southwest of Mainz (Map: Prussia, C 4). Its industries are weaving and the manufacture of shoes, leather ware, and furniture. Pop., 1890, about 6000; 1900, 6900; 1910, 7500. It was known in the fourth century and was built on the site of the Roman settlement of Altiaia. In 1912 excavation brought to light the remains of a stone fort. Volker the Fiddler, a hero of the *Nibelungenlied*, is supposed to have come from Alzey.

ALZOG, ăl'tsôg, JOHANN BAPTIST (1808-78). A Roman Catholic theologian. He was born at Ohlau, Silesia, June 29, 1808, and was professor of church history in the University of Freiburg from 1853 till his death there, March 1, 1878. He wrote a *Manual of Universal Church History*, which is known in many languages (original, Mainz, 1840; 10th ed. by F. X. Kraus, 1882, 2 vols.; Eng. trans., Cincinnati, Ohio, 1874-76, 3 vols.); also *Grundriss der Patrologie oder der ältern christlichen Litterargeschichte* (Freiburg, 1866; 4th ed., 1888). He was, in 1869, a member of the commission on dogma which prepared the work for the Vatican Council, and was the only member of the commission who opposed the promulgation of the dogma of papal infallibility. He concurred in it, however, after its adoption.

AM'ADAS, or **AM'IDAS**, PHILIP (1550-1618). An English navigator. He was born in Hull, England. Sir Walter Raleigh selected him as captain of one of the two ships sent out in 1584 to find a suitable place on the coast of North America for planting a colony. He and Barlow, captain of the other vessel, coasted northeasterly from the vicinity of Cape Fear and reached Ocracoke Inlet (July 13). They landed on the narrow island separating Pamlico Sound from the Atlantic and afterward visited the Indians on Roanoke Island. They returned to England and gave a glowing account of the country, Barlow writing the report. Several years afterward Amadas conducted an expedition to Newfoundland. Consult Hakluyt, *Principall Voyages*, vol. iii (new ed., London, 1809-12).

AMADEO, ă'mă-dă'ô, GIOVANNI ANTONIO (c.1447-1522). A rarer form of the name, OMODEO, also occurs. The most prominent Lombard sculptor of the Renaissance, also a distinguished architect. He was born in 1447 in Pavia and probably studied with local sculptors. His earliest-known work is the door from the church to the lesser cloister of the Certosa of Pavia and several of the fine figured capitals of both cloisters. To this period also, though somewhat later, belong the doors from the church to the sacristy of the Certosa and the Lavado door. The masterpiece of the period, however, is the celebrated Colleoni Chapel in Bergamo (1470-75), one of the finest productions of decorative art of Italy, containing the tombs of the great condottiere and his daughter Medea, as well as many fine reliefs and sculptural decorations. These early works show great talent in composition and a wealth of fantastic decoration; the figures are well rounded and carefully modeled. But he soon adopted a more naturalistic style, resembling that of the Mantegazza (q.v.) brothers, with heavy broken draperies and flat decorative surfaces. This second manner is seen in the reliefs now incased in the pulpit of the cathedral of Cremona and in the masterpiece of all his works, the façade of the Certosa of Pavia, the gem of Lombard architecture and sculpture. He designed the façade and with the aid of assistants, notably Brioso, executed one-half of its sculptures, the remainder being assigned to the Mantegazza brothers. To him we owe the beautiful bas-relief extending across the lower part of the façade, most of the relief medallions, the window frames and other decorations of the upper façade, as well as the floor of the great cloister. Among several tombs which he designed, the most impres-

sive are two now in the chapel of Palazzo Borromeo in the Isola Bella, Lago Maggiore; the larger of these is one of the most typical, and the richest in decoration of the Lombard Renaissance. Amadeo's last important sculpture was the sarcophagus of St. Lanfrancus in the church of that martyr near Pavia, showing a change from his second manner to a third more correct in form and even more original than his previous work.

Amadeo's activity as an architect was second only to his work as a sculptor. Besides designing the façade of the Certosa, he was also, in conjunction with Dolcebuone, architect of Milan Cathedral. To him we owe the light and graceful Gothic spire which is its crowning feature. Its many sculptures were carved by his pupils after his designs. Somewhat earlier he designed the Renaissance Palazzo Bottigella in Pavia and the arcaded extensions of the cathedral. His last years were embittered by the interference of the engineers of Milan Cathedral with his plans, and he died Aug. 27, 1522. Although he belonged both in sculpture and architecture essentially to the Renaissance, his versatility is attested by his treatment of the Gothic in the spire. Consult the monographs on Amadeo by Frizzoni (Rome, 1873), Majocchi (Paris, 1903), Malaguzzi-Valori (Milan, 1905).

AM'ADE'US. A name borne by several members of the House of Savoy (q.v.), including one King of Spain. See AMADEUS I.

AMADEUS I, FERDINAND MARIA (1845-90). Duke of Aosta and King of Spain. He was the second son of Victor Emmanuel of Italy and was Rear-Admiral in the Italian navy and Lieutenant-General in the army. He married Princess Maria del Pozzo della Cisterna, daughter of the Countess de Merode, May 30, 1867. On Nov. 16, 1870, the Cortes of Spain elected him King, and on December 4 Amadeus accepted the crown, with the sanction of his father and the approval of the Great Powers. He reached Madrid Jan. 2, 1871, four days after the assassination of General Prim. He himself was attacked by assassins in July, 1872. In the same year a Carlist rising took place. On Feb. 11, 1873, he abdicated for himself and his heirs, and returned to Italy, the Spanish Cortes proclaiming the Republic, and making Figueras provisional President. Consult Whitehouse, *The Sacrifice of a Throne* (New York, 1897). See SPAIN.

AMADEUS VIII. See under FELIX.

AM'ADIS OF GAUL. A legendary hero of the most famous of mediæval romances, which even the barber of Don Quixote had not the heart to consign to the flames. It was the centre and parent of a cycle of similar tales of chivalry which have their representatives in every literary language of mediæval Europe and even in Hebrew. In what language it was first written is uncertain. Portugal, Spain, France, and England claimed its nativity, and, with the exception of Portugal, all with some show of justice. It owes its inspiration to the Arthurian cycle, appears to have been developed in northern France, the home of the mediæval epic, to have migrated thence to Provence, and to have been carried by the troubadours, either as a complete story or as a tradition, to Spain, where we find the epic mentioned by poets in the middle of the fourteenth century in a way to indicate that it was already widely popular there, though no contemporaneous trace of it has been found in Italy. (Consult Braunfels, *Kritischer Ver-*

such über den Roman Amadis von Gaula, Leipzig, 1876.) The earliest surviving Amadis legend is by the Spaniard Garcia Ordoñez de Montalvo and appears to have been finished about 1470. He allowed himself considerable liberties with the tradition, especially toward the close, and his anonymous successors extended the romance to 12 books and more than three times the length he had given it. It was first printed in 1519, and so fully embodies the taste of the generation that had given it birth that it almost immediately became part and parcel of the literary consciousness of Europe, each nation recognizing and reclaiming its share in it, although they claimed no part of the continuation by Montalvo, in which he described, out of his own invention, the deeds of the son of Amadis, Esplandian. Amadis was rendered into Italian in 1546, and into German before the end of the century. It attracted the attention of Francis I during his captivity at Madrid, and at his command was translated by Nicolas de Herberay, who rendered two-thirds of the Spanish epic into polished French, finishing his work in 1548. Ten translations followed this, with supplementary adventures and imitations, till the whole swelled at last to 25 books, detailing the adventures of an entire family. In its simpler form it tells how its hero, Amadis, the illegitimate son of Perion, King of Gaul, and Elisena, a princess of Brittany, was placed by his mother in a river in a box, was rescued at sea by a Scottish knight, and educated at the Scottish court, was enamored of Oriana, daughter of King Lisuarte of England, married her, returned to Gaul, and spent the rest of his life, there and elsewhere, in manifold adventures. Both the French and the Spanish Amadis were criticised in their own day for defective structure, hyperbolic phantasy, immorality, and irreligion. Their popularity lasted until they themselves had raised up worthier imitators of their example. The first of these was d'Urfé's *Astrée*.

An English version of Amadis, much shortened to its advantage, was made by Southey (London, 1803). For the origin of the story consult Grässe, *Litteraturgeschichte* (Dresden, 1844-50); Körting, *Geschichte des französischen Romans im XVII Jahrhundert* (Leipzig, 1885); and for further bibliography, Braga *Grundriss der romanischen Philologie* (Strassburg, 1893), and Menendez y Pelayo, *Origines de la Novela* (Madrid, 1905).

AMADIS OF GREECE. A supplement to *Amadis of Gaul*, a Spanish work by Feliciano da Silva. It is noteworthy as being perhaps the source of Florizel in Shakespeare's *Winter's Tale*, and of the "Masque of Cupid," in Spenser's *Faerie Queene*.

AMADOR, ä'mä-dör', MANUEL (1833-1909). First president of the Republic of Panama. He was formerly connected with the French diplomatic service in Panama and had some military training. After a short business career in early life, he took up the practice of medicine, becoming distinguished in that profession. In 1903 he took a prominent part in the revolution against Colombia which resulted in Panama's independence. He was elected president of Panama Feb. 17, 1904, and three days afterward was inaugurated to hold office for four years. At the end of that time he declined a renomination. Since his death the main fortification at the Pacific end of the Panama Canal has been named Fort Amador.

AMADOR DE LOS RIOS, ä'má-dōr' dā lōs rē'ōs, José (1818-78). A Spanish critic and historian, born at Baena. He first became known as editor (with Madrazo) of the collection entitled *Monumentos arquitectónicos de España*. His most noted work is the *Historia crítica de la literatura española* (1861-65), of which he completed but seven volumes. Despite many defects resulting from its scope and complexity, and from the date of its composition, this work must still be consulted for the period of which it treats. His other publications include works on the art monuments of Toledo and Seville, a history of Latin-Byzantine art in Spain, and the exhaustive *Historia social, política y religiosa, de los judíos de España y Portugal* (1875-76).

AMADOU, äm'ä-dōō' (Fr. tinder, from *amadouer*, to bait, allure, coax, alluding to its use as tinder during the Middle Ages). A name given to some fungi of the genus *Polyporus*. They grow upon old trees, especially oak and ash in Great Britain and on the continent of Europe. The fungus appears as a leathery or fleshy mass, sometimes becoming hard, often bracket-shaped or hoof-shaped, and its lower surface is pierced by the innumerable "pores" that give name to the genus. *Polyporus igniarius* is called hard amadou, or touchwood. *Polyporus fomentarius* is called soft amadou, or German tinder. They are used as styptics for stanching slight wounds; and when steel and flint were in general use for striking fire, were much employed as tinder. The soft amadou is used for making small surgical pads, for which its elasticity peculiarly fits it. The remarkably light wood of *Hernandia guianensis*, a shrub of the family Thymelæaceæ, is readily kindled by flint and steel and is used as amadou in Guiana.

AMAGER, ä-má'gēr. An island in the district of Copenhagen, Denmark; it is in the Sound, and separated from Zealand by the Kalvebod Strand (Map: Denmark, F 3). Amager has an area of 25 square miles. Christianshavn, at the northern end of the island, forms part of the city of Copenhagen. The chief trade is market gardening for that city. The shipping of the island is of some importance. The inhabitants are chiefly descendants of Dutch emigrants of the sixteenth century, who still preserve their old dress and customs. Pop., 1900, 25,000.

AMAI'MON, or **AMOY'MON** (probably Gk. *ai*, a priv. + Heb. *maimin*, believer). A demon named in the theory of the Middle Ages as king of the eastern part of hell. Asmodeus (q.v.), the demon of desire, was his lieutenant. See allusions in Shakespeare's *Merry Wives of Windsor*, ii, 2, and *Henry IV*, first part, ii, 4.

AMAL'ARIC (502-531). The last Visigothic King of Spain (526-531). He married Clotilda, daughter of Clovis, King of the Franks, in 527, and treated her so badly because she would not embrace Arianism that her brother Childebert marched against him and defeated him. According to Gregory of Tours, Amalaric was killed in the battle; according to others, he fled to Barcelona, where he was killed by rebel subjects.

AM'ALASUN'THA (?-535). Queen of the Ostrogoths, daughter of Theodoric the Great. On the death of Theodoric, her son Athalaric succeeded under the regency of Amalasantha. She was well educated and preferred the Roman civilization. The Goths, who were opposed to

this, incited her son to rebellion in 533. Amalasantha subdued the rebellion, and Athalaric died the following year, at the age of 18. She then associated her cousin Theodahad with her in the kingdom, but did not marry him, as he already had a wife. In 535 Theodahad murdered Amalasantha, under the pretext that she was planning to betray the Goths to Justinian. Her actions had made it probable that she was thinking of retiring to Constantinople. Belisarius avenged her death by killing Theodahad in 536. Consult Hodgkin, *Italy and her Invaders*, vols. iii and iv (2d ed., Oxford, 1896). See **GOTHS**.

AMAL'ECITE. See **MALECITE**.

AM'ALEKITES. An Edomitish tribe in the Negeb (q.v.), south of Judah and north of Kadesh Barnea (q.v.), according to Num. xiii. 29; xiv. 39. Amalek is represented as a son of Eliphaz, the son of Esau by a Horite woman, Timna, his concubine; consequently as a bastard tribe of Edomitish origin (Gen. xxxvi. 12). Their country is first mentioned in Genesis xiv. as the scene of the wars of Chedorlaomer of Elam in the neighborhood of En Mishpath or Kadesh. (See **CHEDORLAOMER**.) The memory of early struggles between Amalek and the invading tribes has probably been preserved in the accounts of an Amalekite victory at Horma (Num. xiv. 45) and a defeat at Rephidim (Ex. xvii. 8-16). In the days of Saul they were almost annihilated (1 Sam. xv. 2), and later David overcame a band of marauding Amalekites with great slaughter, pursuing them until "there escaped not a man of them save 400 young men who had camels and fled" (1 Sam. xxx. 1-20). In the prophecies of Balaam, which are ascribed by many critics to the age of David, Amalek is described as "the first of nations," but "his end is sure destruction" (Num. xxiv. 20). The inveterate hostility between Amalek and Israel is reflected in so late a production as the Book of Esther, where the designation of Haman, the arch-enemy of the Jews, as "the Agagite" (Esther iii. 1), is introduced in order to emphasize his descent from Agag, the King of Amalek (Num. xxiv. 7). Grimme has suggested that Amalek is a broken plural of Amlak and that it is identical with Meluhha, a country frequently mentioned in Babylonian inscriptions and apparently designating northwestern Arabia, at least, in earlier times. But this identification is very uncertain. Consult: Eduard Meyer, *Die Israeliten und ihre Nachbarstämme*, pp. 345 ff. (1906); Grimme, *Mohammed*, p. 11 (1904); Schmidt, *Messages of the Poets*, pp. 333 ff. (1911).

AMALFI, ä-mäl'fē. A seaport town in Campania, south Italy, situated on the Gulf of Salerno, about 22 miles southeast of Naples. It is built on the slope of a mountain rising from the coast and covered with splendid trees and gardens. The houses tower one above another and are connected by stairways and bridges. The most interesting building of the place is the old cathedral, with its bronze doors cast in Constantinople in the eleventh century, a mosaic façade, and columns from Pæstum. An old Capuchin monastery, dating from the beginning of the thirteenth century, is now used as a hotel. It is finely situated west of Amalfi in the hollow of a rock rising about 230 feet from the sea. The town produces paper, soap, and macaroni, but these industries are declining. Pop., 1901, 7300; 1911, 7472. According to local tradition, Amalfi was founded by Constantine

the Great. From the ninth to the eleventh century it was an independent state and was ruled by doges. Early in the Middle Ages the city had a population of 50,000 and rivaled in importance Genoa and Pisa, with the latter of which Amalfi was continually at variance. One of the oldest maritime codes, the *Tavole Amalfitane*, was compiled in Amalfi, and the town is otherwise famous as being the birthplace of Flavio Gioja and of Masaniello.

AMAL'GAM (Lat. Gk. μάλαγμα, *malagma*, an emollient, plaster, from μαλακός, *malakos*, soft). An alloy of mercury with one or more other metals. An amalgam of silver crystallizing in the isometric system has been found native; a gold amalgam, too, has been reported from several localities, including California. Artificially, amalgams are made (1) by bringing metallic mercury into contact with another metal, as antimony, arsenic, bismuth, etc.; (2) by bringing mercury into contact with a saturated solution of a salt of the other metal, when part of the mercury goes into solution and the remainder combines with the liberated metal, which is the case with calcium, iron, and certain other metals; (3) by placing the metal to be amalgamated in a solution of a salt of mercury, which is the usual method for amalgamating copper and aluminum; finally (4) by placing the metal to be amalgamated in contact with mercury and dilute acids.

Amalgams may be either solid or liquid. Those which are liquid are regarded as solutions in which there is an excess of mercury. The more important amalgams are as follows: *Copper amalgam*, which is made by triturating finely divided metallic copper with mercurous sulphate under hot water. This amalgam has the property of softening when kneaded, and becoming quite hard after standing some hours, which has led to its use for filling teeth. *Gold amalgam* is formed by heating mercury with powdered gold or gold foil. The readiness with which mercury combines with gold has been made the basis of an important process for the extraction of the latter from ores. After the ore containing the free gold is crushed to a fine powder it is washed over copper plates, the surface of which contains a thin film of mercury. The free gold is caught by the mercury, forming an alloy or amalgam which can be scraped from the plate in a plastic condition. The percentage of gold in this amalgam, or its fineness, varies with the size of the gold particles; coarse gold produces high-grade amalgam, whereas fine gold produces low-grade amalgam. The gold is recovered by washing foreign matter from the amalgam in hot water with an excess of mercury, squeezing the excess of mercury from the resultant amalgam through chamois or canvas, and then placing the residue in a retort from which the balance of the mercury is distilled and condensed for further use. Oils or grease coming in contact with the crushed ore will prevent the gold from forming an amalgam with the mercury. *Silver amalgam* is formed by the union of mercury with finely divided silver, and this fact is taken advantage of for the extraction of silver from its ores by a process analogous to that described in connection with gold amalgam. An amalgam consisting of eight parts of mercury to one part of silver is used for silvering metals.

Mercury readily combines with sodium when the two elements are brought in contact with

each other, yielding an amalgam which is used for amalgamating copper plates, and in the chemical industry as a reducing agent. *Tin amalgam* is formed when mercury is brought in contact with tin in the proportions of three parts of the former to one part of the latter. This amalgam is the one commonly used for silvering mirrors. *Zinc amalgam* results when zinc filings are mixed with mercury at a heat somewhat below the boiling point of the latter. It is used for coating the rubbers of electric machines. Amalgams of bismuth, cadmium, magnesium, potassium, and other metals are known, but have no important commercial uses. Consult: Dudley, "An Index to the Literature of Amalgams," in *Proceedings of the American Association for the Advancement of Science* (Salem, 1889); Rose, *The Metallurgy of Gold* (London, 1902); Eissler, *The Metallurgy of Gold* (London, 1896).

AMAL'GAMA'TION. See GALVANIC BATTERY.

AMALIA, à-mä'lê-à, ANNA (1739–1807). The wife of Duke Ernst August of Saxe-Weimar-Eisenach. She was born at Wölfenbüttel. On the death of her husband, in 1758, she was appointed Regent for her infant son, Karl August, whom, aided by his tutor, Wieland, she trained in the love of literature and art, also doing much to foster education and material prosperity throughout his domains. Soon after assuming the government, the Duke, with his mother's active coöperation, gathered at Weimar a galaxy of literary talent probably never equaled. Goethe, Herder, and Schiller were its brightest stars, but they shone in goodly company. Weimar continued during and beyond her life what she, more than any other, had made it, the literary centre of Germany. Consult Gerard, *A Grand Duchess, The Life of Anna Amalia, and the Classical Circle of Weimar* (New York, 1902), and see GOETHE.

AMALIE, à-mä'lê-ê, MARIE, or MARIE AMÉLIE (1782–1866). The wife of Louis Philippe, King of the French. She was the daughter of King Ferdinand I (IV) of the Two Sicilies. When she married Louis Philippe (then Duke of Orleans), he was a political exile, without hope of ever rising to the throne of France. Amalie never interfered in politics and, possessing all the domestic virtues, was happy with her husband.

AMALIE, à-mä'lê-e, MARIE FRIEDERIKE (1818–75). Queen of Greece, daughter of Grand Duke Augustus of Oldenburg. She married King Otho of Greece, Nov. 22, 1836, shared in her husband's unpopularity, and after his deposition in 1862 accompanied him to Bavaria, residing after his death at Bamberg.

AMALRIC. See AMAURY.

AMAL'RIC OF BENE, bán (d. between 1204–07). Also called AMAURY OF CHARTRES. The founder of a school of Pantheists known by his name. He was born at Bène, near Chartres. He lectured in Paris upon philosophy and theology about 1200. He held that God is all, and that he who believes this can commit no sin. His doctrines were condemned by the university. Pope Innocent III confirmed the condemnation (1204) and ordered Amalric to return to Paris and recant, which he did, and so when he died, which was in the same year, he was buried in the consecrated ground of the monastery of St. Martin des Champs, Paris. But when it was discovered that the sect which he had founded had spread throughout France, a synod was

called in Paris in 1209, his teaching formally condemned, several of his followers burned at the stake as heretics, and his own body was also dug up, burned, and the ashes thrown to the winds. His doctrines were formally condemned by the fourth Lateran Council in 1215. Consult Haureau, *Histoire de Scholastique*, and Hefele, *Conciliengeschichte*.

AM'ALS, or **AM'ALI**. The royal family of the Ostrogoths, which furnished the sovereigns for about two centuries. The most noted were Theodoric the Great (q.v.), Amalasu(n)tha, and Witigis. The race came to an end in 605, when Germanus Postumus and his daughter were put to death by Phocas. Hodgkin, in *Italy and her Invaders*, vol. iii (Oxford, 1896), gives a genealogical table of the Amals.

AM'ALTHE'A (Gk. Ἀμάλθεια, *Amaltheia*). A nymph, the nurse of the infant Zeus. The name was transferred to the goat which, according to the Cretan legend, suckled the god and was rewarded with a place among the stars. This goat was called first merely *Aiæ*, the Greek word for goat, and was thought of as the property of Themis and the nymph Amalthea. Amalthea was in origin a fructifying earth-goddess, and so was naturally associated with Ge ('Earth') and Themis. The "cornucopia," or horn of plenty, really an attribute of all the deities who were believed to control the fruits of the earth, was said to be the horn of the goat Amalthea, which had been broken upon a tree. See **ÆGIS**.

AMA'MA, SIXTINUS (1593-1629). A Dutch Orientalist. He was born at Franeker, Friesland, studied Oriental languages at the University there, and subsequently at Exeter College, Oxford. He succeeded Drusius as professor of Hebrew at Franeker. In 1625 he was called to Leyden, but the Estates of Friesland refused to permit him to go. He was among the first to advocate a thorough knowledge of the original languages of the Bible as indispensable to theologians. His works include: *Dissertatio qua Ostenditur Præcipuos Papismi Errores ex Ignorantia Hebraismi Ortum Sumpsisse* (1618), *Censura Vulgatæ Versionis V Librorum Mosis* (1620), and a *Hebreeuwisch Woordenboek* (1628).

AMANA, äm'ä-nä. A German religious community established at Amana, Iowa, comprising several villages of settlers situated a few miles apart under the government of a president and 13 directors, elected annually by the community. Family life is preserved, but meals are provided for a number of families together. Woolen mills, flour mills, sawmills, dye-shops, and agriculture are the chief industries operated in common for the benefit of all. Life is simple, and all necessaries are furnished freely to members of the community. New members are elected after a probationary period. Daily prayer meetings are held. The sect was founded by Eberhard Gruber in Württemberg, Germany, 1714, and came to America, 1843, settling first in western New York and moving to Amana, 1855-64. The community in 1913 numbered about 1800 persons and owned 26,000 acres of land, their total property being valued at \$1,800,000. Consult B. M. Shambaugh, *Amana, the Community of True Inspiration* (1908). See **COMMUNISM**; **COMMUNISTIC SOCIETIES**.

AMAN'DA. In Cibber's comedy, *Love's Last Shift*, and Vanbrugh's *The Relapse* (from which Sheridan made *A Trip to Scarborough*), the faithful and charming wife of Loveless, who has

basely deserted her, but is finally won back by the sense of her fidelity.

AMANDE DE TERRE, ä'mänd' de târ'. The French name for *Cyperus esculentus*. See **CHUFA**.

AMAN-JEAN, ä'män'jän', EDMOND (1860—). A French portrait and decorative painter. He was born in Chevry-Cossigny (Seine et Marne) and studied principally with Lehman in the Ecole des Beaux Arts, Paris. His art is correct in design, excels especially in delicate and original color, and altogether renders him a most subtle portraitist of women. His chief works include two scenes from the life of Joan of Arc (1887-88) in the Museum of Orleans; portrait of a young lady (1891) in the Luxembourg Gallery, Paris; three decorative pieces in the Musée des Arts Decoratifs; La Vasque, a decorative panel in the Carnegie Institute, Pittsburgh, and Madame N. (1906) in the Museum of Buenos Aires. He excels especially in pastels, depicting enchanting heads of young women. An exhibition of 10 of his best paintings, along with many others of the advanced French group, was held in Buffalo in 1910, and afterwards in other American cities.

AM'ANI'TA (Gk. nom. pl. ἀμανίται, *amanitai*, a sort of fungus). A genus of poisonous fungi related to *Agaricus*. *Amanita muscaria*, which is common in woods, especially of fir and beech, in Great Britain, and also in the United States, is one of the most poisonous fungi. It is sometimes called fly agaric, being used in Sweden and other countries to kill flies and bugs, for which purpose it is steeped in milk. The pileus or cap is orange-red, with white warts, the gills white, and the stem bulbous. It grows to a considerable size. Notwithstanding its very poisonous nature, it is used by the natives of Kamtchatka to produce intoxication. *Amanita phalloides*, commonly called death cup, is quite similar to the fly agaric. It is perfectly white, with white spores, and a ring on the stem. For illustration, see **FUNGI**, **POISONOUS**.

AMANTS MAGNIFIQUES, ä'män' mä'nyë-fêk' (Fr. magnificent lovers). A prose comedy in five acts by Molière, written by order of Louis XIV in 1670. The two lovers are princely rivals, who give various entertainments and ballets for which the slender plot is made the occasion.

AMAPALA, ä-mä'pä-lä. A free port of Honduras, situated on the north shore of the island of Tigre, in the Gulf of Fonseca, about 950 miles from Panama (Map: Central America, D 4). The harbor is very good, capable of containing vessels of the deepest draught, and the town has a healthful climate. It has secured a good part of the trade of San Salvador and Nicaragua, as it is the only large port of Honduras on the Pacific coast. The chief articles of export are hides and coffee. Gold, silver, and mineral ores were formerly exported in great quantities. The town was founded in 1838, and the opening of the port took place in 1868. Pop., about 3000.

AMARA-KOSA, äm'ä-rä kō'shā. See **AMARASINHA**.

AM'ARANT. A giant slain by the legendary Guy of Warwick (q.v.) in the Holy Land.

AM'ARANTH (Gk. ἀμάραντος, *amarantos*, from ἀ, *a*, priv. + μαραινειν, *marainein*, to die away, wither), *Amaranthus*. A genus of plants of the family Amaranthaceæ. This genus contains about 50 species of wide distribution, but chiefly abounding within the tropics. They are herbs or shrubs, with simple leaves, and flowers

in heads or spikes. The genus *Amaranthus* has mostly monœcious flowers. Some of the species are naturally of singular form, and others assume singular but monstrous forms through cultivation. Love-lies-bleeding (*Amaranthus caudatus*), prince's feather (*Amaranthus hypochondriacus*), and other species are common annuals in our flower gardens. The spikes of *Amaranthus caudatus* are sometimes several feet in length. The dry red bracts which surround the flower retain their freshness for a long time after being gathered, for which reason the plant has been employed by poets as an emblem of immortality. The globe amaranth (*Gomphrena globosa*) and the cockscomb, well-known tender annuals, belong to the same family. The globe amaranth is much cultivated in Portugal and other Roman Catholic countries for adorning churches in winter. Its flowers, which are of a shining purple, retain their beauty and freshness for several years. About a dozen species are native and introduced in the United States, where they are mostly coarse annual weeds. *Amaranthus blitum*, *Amaranthus oleraceus* (Chusan han-tsi), and other species are used as pot-herbs. Wholesome mucilaginous qualities are generally found in the leaves throughout the order. The seeds of *Amaranthus frumentaceus* (called kiery) and of *Amaranthus anardana*, or *Amaranthus paniculatus*, are gathered for food in India. Medicinal properties are ascribed to some species of the family, particularly to *Gomphrena officinalis* and *Gomphrena macrocephala*, which have a high and probably exaggerated reputation in Brazil as cures for many diseases.

AM'ARANTHA'CEÆ, AMARANTH FAMILY (for derivation, see AMARANTH). A family of dicotyledonous plants, embracing about 500 species. They are widely distributed, but are most abundant in the tropics. In floral characters they greatly resemble the Chenopodiaceæ, differing in some minor particulars and in habit of growth. The general inflorescence is racemose, the auxiliary cymes going to make up a compound inflorescence. In general habit most of the species are rather coarse weeds, although some are grown as ornamentals, such as cockscomb, prince's feather, love-lies-bleeding, etc. The chief genera are *Amarantus*, *Celosia*, *Gomphrena*, and *Iresine*.

AMARAPURA, ūm'ā-rā-pōō'rā, or UMMERAPURA, City of the gods. The former capital of Burma, situated on the east bank of the Irrawaddy, and on the Rangoon and Mandalay Railway, 9 miles northeast of Ava, in lat. 21° 57' N., long. 96° 7' E. It was founded in 1783; in 1810 it was almost totally destroyed by fire; and in 1839 an earthquake laid it in ruins. In 1852-53 it was finally deserted and the capital of the country removed to Mandalay. Nothing remains of the old city save some rows of beautiful trees and interesting ruins of a palace and of several pagodas. A celebrated temple in the suburbs contains a famous colossal bronze image of Gautama (Buddha). The population in 1810 was estimated at 170,000; it has declined to less than 9000.

AM'ARASIN'HA, or **AM'ARA-SIM'HA**. A celebrated Sanskrit lexicographer of antiquity, whose vocabulary, *Amara-kośa*, or Amara's Treasury, formed a storehouse of words in early times and a mine of information for later workers in the field. This glossator is commonly called simply Amara in the native commentaries;

but his title *Simha* shows that he belonged to the princely class. Little is known of his life, except that he was a Buddhist in religion, and it is assumed that all his writings, except the dictionary, perished through the persecutions which the Buddhists at one time suffered at the hands of the orthodox Brahmans. There is, however, great uncertainty as to the time when Amara lived. His date has been generally put at about 500 A.D., though by some authorities it is given as a century or more earlier. His name is associated with the poet Kalidasa (q.v.) and the others of the "nine gems" at the court of Vikramaditya in an Augustan Age of Sanskrit literature. The sixth century A.D. is the date most commonly assigned for the reign of this monarch; but the Hindus place him some centuries earlier, a view which there is rather a tendency to follow than to reject. (See KALIDASA.) The real title of Amara's Sanskrit vocabulary is not *Amara-kośa*, but *Nāmalingānūsāsana*, 'a book of words and genders.' It is also called *Tri-kāṇḍa* or *Trikāṇḍi*, i.e., tripartite, from its three books of words and homonyms relating to the world and man and miscellaneous matters. The second of these is the longest, and each book is subdivided into chapters, called *vargas*. The whole work comprises about 1500 verses, generally consisting of lines of 16 syllables, and the words, about 10,000 in number, are arranged, not alphabetically, but, in general, as synonyms according to subject and gender. There are numerous editions of the *Amara-kośa*, accompanied also by the old native commentaries. Mention may be made of the edition with introduction, English notes, and index by Colebrooke (Serampore, 1808). This was reprinted in 1829. A French edition, with translation, was published by Loiseleur-Deslongchamps (2 vols., Paris, 1839-45). Valuable are the editions by Chintāmani Sāstrī Thatte, under the superintendence of F. Kielhorn (2d ed., Bombay, 1882), and in the collection of Sanskrit ancient lexicons, or Abhidhānasangraha (Bombay, 1889). Consult Zachariæ, "Die indischen Wörterbücher (Koś'a)," in Bühler's *Grundriss der indo-arischen Philologie und Altertumskunde* (Strassburg, 1897).

AMARI, ā-mā'rē, MICHELE (1806-89). An Italian historian and Orientalist. He was born at Palermo. At the age of 16 he entered a government office, and soon afterward—his father being condemned to 30 years' imprisonment for a political crime—the duty of supporting his mother and the other members of the family devolved upon him. He succeeded, nevertheless, in acquiring an education, learned French and English, and published a translation of *Marmion* in 1832. In 1837 he removed to Naples. In 1841 appeared his masterpiece, *La Guerra del Vespro Siciliano* ('The War of the Sicilian Vespers'), in which the author overthrows the prevalent notion, established by Villani, of the cause of the famous massacre of 1282. The book was quickly prohibited and, as a consequence, widely read. It was translated into German by Dr. Schröder, of Hildesheim, and into English by Lord Ellesmere. Dreading punishment at Naples, Amari fled to France, where he gave himself up to the study of Arabic and modern Greek, and to the preparation of his *Storia dei Musulmani di Sicilia* (1854-68). Upon the outbreak of the revolution of 1848, he returned to Italy, and shortly after his arrival was elected vice president of the committee of war in Sicily.

AMARYLLIDACEÆ



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- 1 LILY OF THE PALACE - HIPPEASTRUM
 2 NARCISSUS - NARCISSUS PSEUDO-NARCISSUS
 3 FOTHERGILLIA - NERINE CURVIFOLIA

- 4 ATAMASCO LILY - ZEPHYRANTHES ATAMASCO
 5 HYMENOCALLIS - HYMENOCALLIS GRASSIFOLIA
 6 STAR GRASS - HYPOXIS

- 7 COOPERIA - COOPERIA DRUMMONDII

He was next sent on a diplomatic mission by the provisional government to France and England. In 1849 he published at Paris *La Sicile et les Bourbons*, to show up the pretensions of the Neapolitan sovereign. After the Sicilian insurrection had been quelled, Amari took up his residence in Paris, where he devoted himself to literary pursuits till 1859, when he returned to Italy, fighting the following year under Garibaldi. He was made Senator in 1861, and in 1862-64 was Minister of Instruction. He resigned his professorship at Florence in 1878 and removed to Rome, where he continued his historical studies. He died July 16, 1889. Other writings of Amari are upon the language and history of the Arabs, in the *Revue Archéologique*, the *Journal Asiatique*, etc. His letters were published at Turin (1896).

AMARILLO. A city in Potter Co., Texas, 32 miles southwest of Panhandle, on the Fort Worth and Denver City, the Atchison, Topeka, and Santa Fe, the Chicago, Rock Island, and Gulf, the Pecos and Northern Texas, and the Southern Kansas of Texas railroads (Map: Texas, B 2). The city is in a productive agricultural and stock-raising region and has some manufactures. Its growth has been rapid. Pop., 1890, 482; 1900, 1442; 1910, 9957.

AMAR'NA LET'TERS. A collection of more than 300 letters and dispatches, inscribed upon clay tablets, which were found, in the winter of 1887-88, in the village of Telel-Amarna (q.v.) in Middle Egypt. They represent the Asiatic correspondence of the Egyptian court about 1400 B.C., and it is a remarkable fact that they are in the cuneiform character, and, with three exceptions, in the Babylonian language, which would thus appear to have been the medium of diplomatic communication throughout western Asia. One of the letters is in the language of Mitani, in northern Mesopotamia, and two are in that of Arçapi or Arzaya (probably Cyprus). Among the writers are the Egyptian kings Amenophis III (q.v.) and Amenophis IV (q.v.), and the kings of Mitani, of Babylonia, of the Hittites, and of Alashia (Cyprus). It appears from these letters that the Egyptian kings of the eighteenth dynasty intermarried with the royal houses of both Mitani and Babylonia. Amenophis III married a sister of Kadashman-Bel, King of Babylonia, and also a sister of Dushratta, King of Mitani; while Amenophis IV married a niece of his father's Mitanian wife. Frequent reference is made to commercial affairs, implying a considerable intercourse between Egypt and the Asiatic States. By far the greater number of the Amarna letters proceed from Egyptian officials and subject allies in Syria, at that time a dependency of Egypt, and afford a valuable insight into the state of Palestine before the Hebrew invasion. The growing weakness of Egypt and the extension of the Hittite dominion in the north can be clearly seen, and the withdrawal of the Egyptian troops gave opportunity for conflicts between the princes of the small city-states into which the land was broken up. To add to the general confusion, the country was threatened on the east by the Khabiri—marauding nomads from the Arabian Desert, whose sphere of activity extended from southern Palestine as far north as Sidon, Beirut, and Gebal. Some scholars are inclined to identify the Khabiri with the Hebrews, but this theory has not met with general approval. The letters of

the Palestinian princes, which are full of mutual recriminations, reveal the fact that there were two chief parties—one loyal to Egypt, the other professing loyalty, but in reality allied with the enemies of Egypt and everywhere successful. Among the most zealous supporters of Egypt was the Prince of Jerusalem, at this time a city of some importance. Two letters are written in a curious dialect which has been taken as the oldest known specimen of Indo-Germanic. Consult: Winkler, in *Schraders Keilinschriftliche Bibliothek* (Berlin, 1896); Eng. trans. by Metcalfe, *The Tell El Amarna Letters* (New York, 1896); Knudtzen, *Die Zwei Arzawa-Briefe* (Leipzig, 1902).

AM'ARYL'LIDA'CEÆ (THE AMARYLLIS FAMILY). A family of monocotyledonous plants with about 70 genera and nearly 1000 species. The plants resemble those of the Liliaceæ in many respects, except that they all have inferior ovaries. The species are mostly tropical and subtropical, and are generally found in dry regions. Many are bulbous, leafing and flowering only in the wet season, while others have thick fleshy leaves covered with wax or otherwise protected for their xerophytic habitat. Some of the Amaryllidaceæ are of great economic value (see AGAVE, HEMP, SISAL), while many others are extensively cultivated as ornamentals. See NARCISSUS; AMARYLLIS; BLOOD FLOWER; ALSTREMERIA; GALANTHUS; POLIANTHES, ETC.

AM'ARYL'LIS (from the famous nymph *Amaryllis*). A genus of bulbous-rooted plants of the family Amaryllidaceæ. Originally the genus included a large number of species, natives of the warmer regions of the globe, but most of them have been put into other genera, until in some writings only one South African species is left in *Amaryllis*. Many of them have flowers of very great beauty. A species known as *Amaryllis formosissima* was brought to Europe from South America in the end of the seventeenth century and has since been in common cultivation as a garden flower. Its scentless flowers are of a beautiful red color, exhibiting a play of golden gleams in the sunshine. *Amaryllis belladonna*, known also as the belladonna lily, has a scape one to three feet high, bearing an umbel of rose-colored fragrant flowers. *Amaryllis amabilis*, *Amaryllis josephinae*, and *Amaryllis vittata* are among the most admired bulbous-rooted plants. *Amaryllis sarniensis* is one of the most hardy species, flowering freely in Guernsey, with a little protection during winter, and although commonly called Guernsey lily, it is supposed to be a native of Japan. By artificial pollination, a great number of hybrid forms have been produced.

AMARYLLIS. A shepherdess in the *Idyls* of Theocritus and in Vergil's *Eclogues*. The name is sometimes used as the type of a bucolic sweetheart, as in the pastoral of *The Faithful Shepherdess*, by Fletcher, and Milton's *Lycidas*.

AM'ASA. See JOAB.

AMASIA, à-mä'sê-à (ancient Gk. Ἀμάσεια, *Amaseia*). A town of Asiatic Turkey, the capital of the sanjak of the same name, in the vilayet of Sivas, on the right bank of the Yeshil-Irmak, 200 miles southwest of Trebizond (Map: Turkey in Asia, F 2). It stands in a deep and narrow valley, and the river, flowing through a narrow channel, between precipitous rocky banks, affords fine water power and is used for irrigation purposes. Amasia is the centre of the silk industry in Asia Minor, and

exports silk and grain to Aleppo, Damascus, and even Constantinople. It contains a fine bazaar and a large number of Mohammedan schools for higher education. There are to be found the ruins of an old castle, built on the site of the ancient acropolis, and a number of archaic remains. The population is estimated at 30,000. Amasia was the birthplace of the geographer Strabo, and was once the capital of the kings of Pontus, whose tombs have been discovered near by.

AMA'SIS (Gk. *'Αμάσις*, Egyptian *'Ah-mose*, probably 'child of the moon'), or **AAHMES**. The name of two Egyptian kings.—**AMASIS I.** The first Pharaoh of the eighteenth dynasty. He reigned for at least 22 years, from about 1600 B.C., or perhaps a little later. He finished the long war against the Hyksos or Shepherd Kings, rulers of a foreign race, who had subjugated part of Lower Egypt. He captured their stronghold, Avaris, in the Delta, expelled them from Egypt, and began the Egyptian conquests in Asia by making Palestine and Phœnicia tributary.—**AMASIS II.** The fifth Pharaoh of the twenty-sixth dynasty, well known through the anecdotes of Herodotus. Egyptian sources tend to confirm the statements of the Greeks that he was of humble origin and not particularly refined as to habits. He came to the throne through an insurrection of the native troops against King Apries (q.v.), whom he dethroned and slew. The usurper reigned from about 570 to 526 B.C. and was a wise and prudent ruler. He fought against Nebuchadnezzar and later cleverly avoided the conflict with the rising Persian power. (See History of Egypt, under title EGYPT.) The conquest of Cyprus is ascribed to him, though perhaps erroneously. He employed Greek mercenary troops and assigned to the Greeks the city of Naucratis, in the Delta, which soon rose to great commercial importance. Greek writers speak of Anasis in a very kindly spirit and endeavor to prove that he was the friend of various Greek sages and statesmen. (See POLYCRATES.) He is said to have married a Greek woman of Cyrene, but it is quite impossible that she could have been his legitimate wife.

AMATEUR' (Fr. from Lat. *amator*, lover, from *amare*, to love). It would seem at first easy to define the word "amateur" in sports; yet it is a subject that has for half a century taxed the most active and subtle brains of two continents. One would say offhand that the amateur in sport is one who engages in a personal physical contest of pluck, nerve, muscle, and skill for the love of it, as distinguished from the professional, who enters for profit; but that by no means disposes of this intricate subject. There were early found to be men in plenty who entered a particular contest because they loved the sport and who derived no pecuniary interest from that contest, yet whom it was unfair to allow to enter it. As a matter of fact, not long after the renaissance of athletic contests in 1850, it became obvious that the lines would have to be drawn more strictly, or those would have an unfair advantage whose daily occupations gave them a continuous training in the skill needful for perfection. Take, for example, a boat-builder of the old school, one who had been apprenticed to it in his youth and had spent all his early manhood in the handling of boats and oars and in rowing and gradually acquiring the knowledge, power, and

endurance of a waterman. To such a man, trained and hardened by years, rowing became a second nature, and his skill in it automatic. It was plainly unfair to allow such a man, however much he rowed for love of the sport and without taking money for his prize, to enter contests where the rest of the participants had acquired their knowledge and skill only for the pleasure of the game and as part of the ordinary routine of school and college or for health and pleasure's sake. So it came to pass that the boat-builder and waterman were early excluded from the amateur ranks. The same principle has been working itself out ever since. Step by step the fences against professionalism have had to be raised, until now the rules bar them out of all contests under the control of the Amateur Rowing Association of England. No person can enter as an amateur "who has rowed or steered in any race for a stake, money, or entrance fee; who has ever knowingly rowed or steered with or against a professional for any prize; who has ever taught, pursued, or assisted in the practice of athletic exercises for any kind of profit; who has ever been employed in or about boats, or in any manual labor for money or wages; who is or has been by trade or employment for wages a mechanic, artisan, laborer, or engaged in any menial duty; or who is disqualified as an amateur in any other branch of sport." The most jealous stickler for the purity of amateur oarsmanship could hardly desire the line to be more firmly or decisively drawn; yet the rules governing amateur athletics in America do go farther, for, *inter alia*, they make a man a professional who engages in an athletic contest where professionals participate, even though no prize is at stake. The following are the rules of the Amateur Athletic Union, which claims jurisdiction over the following games: (1) Basket ball, (2) billiards, (3) boxing, (4) fencing, (5) gymnastics, (6) hand ball, (7) hurdle racing, (8) jumping, (9) lacrosse, (10) pole vaulting, (11) putting the shot and throwing the discus, hammer, and weights, (12) running, (13) swimming, (14) tugs of war, (15) walking, (16) wrestling.

Conditions of Competition.—"1. No person shall be eligible to compete in any athletic meeting, game, or entertainment given or sanctioned by this Union who has (a) received or competed for compensation or reward, in any form, for the display, exercise, or example of his skill in or knowledge of any athletic exercise, or for rendering personal service of any kind to any athletic organization, or for becoming or continuing a member of any athletic organization; or (b) has entered any competition under a name other than his own, or from a club of which he was not at that time a member in good standing; or (c) has knowingly entered any competition open to any professional or professionals, or has knowingly competed with any professional for any prize or token; or (d) has issued or allowed to be issued in his behalf any challenge to compete against any professional, or for money, or (e) has pawned, bartered, or sold any prize won in athletic competition, or (f) is not a registered athlete. Nor shall any person residing within the territory of any active member of this Union be eligible to compete for or to enter any competition as a member of any club in the territory of any other active member of this Union, unless he shall have been elected to membership in such

club prior to April 1, 1891; provided, however, that this restriction as to residence shall not apply to undergraduates connected with any allied college athletic organization.

"2. No one shall be eligible to compete in any athletic meeting, games, or entertainment given or sanctioned by this Union, unless he shall be a duly registered athlete, a member of the organization from which he enters, and shall not have competed from any club in this Union during a period of three months next preceding such entry; nor shall any member of any club in this Union, or any club in any district in this Union, be allowed to compete in case he has within one year competed as a member of any other club then in this Union, except with the consent of such other club, which consent shall be filed with the Registration Committee of his district prior to such competition, unless such other club shall have disbanded or practically ceased to exist; provided, that the requirements of this section shall not apply to any athletic meeting, games, or entertainment, the entries for which are confined to the club or organization giving such meeting or entertainment.

"No athlete who has been released from a club which is a member of this Union, and who competes for another club directly thereafter, shall be allowed to compete again for the club he was released from for one year from the date of his release, except that the club has disbanded or ceased to exist.

"No person shall be eligible to compete for or enter any competition as a member of any club in the territory of any active member of this Union, unless he shall have resided within the territory of said active member at least four months previous to entering for competition; nor shall any person be eligible to enter or compete in any district championship meeting unless he shall have been a *bona fide* resident of such district for at least six months prior to the holding of such championship meeting; and no person shall be eligible to compete in a championship meeting of more than one district in one year. The restrictions contained in this section shall not affect the eligibility of an undergraduate connected with any allied college athletic organization who shall have been elected to membership in any club of this Union prior to Nov. 20, 1899, to represent such club as long as he remains an undergraduate; nor shall these restrictions apply to an undergraduate competing for any college belonging to an allied body.

"3. No prizes shall be given by any individual, club, committee, or association, or competed for or accepted by any athlete, except suitably inscribed wreaths, diplomas, banners, badges, medals, time-pieces and mantel ornaments, or articles of jewelry, silverware, table or toilet service, unless authorized by the Registration Committee."

It will be noticed that this organization does not control golf, in which game amateurs may play in contests against professionals even for a prize; with this limitation, however, that if, in the open contest, an amateur win he must take the prize in plate, and not in money. The golf rules are formulated and enforced by the United States Golf Association.

In cricket there is no bar whatever to playing against or with professionals openly paid for their services or even hired season after season by their clubs; but cricket has been in

existence so long, and its ethics are so well understood that no harm results; the professional needs no laws to define his social position or the part he takes in a game which has escaped the eagerness so characteristic of the more modern games. In fact, in nearly every sport there are shades and differences in definition and practice. Notably is this so in bicycling, wherein the classification has been altered several times, and in football, where the rules of college games extend so far as to limit the contestants to those who have been resident pupils for such and such a time and are in such and such an educational grade. Other minute distinctions entitle a man to or debar him from the right to play, and readers desiring to be perfectly sure of their position on any given sport, in any given year, will do well to consult the actual rules in force formulated by the governing body of the sport.

Professionalism sometimes tends to elevate the standard of sports so far as records are concerned, and it is not in itself necessarily bad. But, although some of the truest sportsmen have been professionals, the nature of sport is such that its best uses, recreation and emulation, are in danger of being lost sight of by the professional whose aim is to make money. Baseball in this country has lost none of its popularity through professionalism, its control now being adequate. Bicycle racing, however, has degenerated into a mere gate-money exhibition. In England football is in danger from the same cause, while in America football is played almost exclusively by the colleges, and professionalism is practically unknown. Into some other sports the spirit of professionalism has never entered; notably is this so in lawn tennis, curling, quoits, canoeing, archery, polo, croquet, and its successor roque. These and a few other games have always been played solely by enthusiastic lovers of them. The amateur spirit is essentially a moral quality, and the games will retrograde, or otherwise, just in proportion as the moral code of the contestants is interpreted. Laws are next to useless where men are determined to evade them. Happily, the tendency of the times is distinctly toward a higher plane of interpretation and a stricter separation of the amateur from the professional.

The most conspicuous case in recent years of the enforcement in this country of the standards of amateurism was that of James Thorpe, the remarkable American Indian athlete, who won the all-round championship in the Olympic Games at Stockholm in 1912. Early in the following year it became known that Thorpe, using his own name, had been a salaried member of obscure North Carolina baseball teams in 1909 and 1910. Thorpe (who was a student at the Carlisle Indian School when he was entered in the Olympic Games) admitted the charge, but declared that he did not realize that playing ball for money had made him a professional. The American Olympic Committee and the Amateur Athletic Union promptly disclaimed any previous knowledge or hint of Thorpe's professionalism, apologized to the International Olympic Committee and to the nations concerned for having entered him in the games, and repudiated him as an American contestant. Thorpe returned the trophies he had won at Stockholm and soon after (in 1913) became a member of the New York baseball team in the National League. See OLYMPIC GAMES.

AMATI, ä-mä'tê. A family of celebrated Italian violin makers, who lived in Cremona. Andrea, the eldest, born about 1510, was descended from an ancient family dating back to the eleventh century. The date of his death is also unknown, but it is established that he was still living in April, 1611. He was the founder of the Cremona school of violin makers. His early instruments are so Breseian in character that he is supposed to have been a pupil of Gasparo da Salò. Few of his violins are extant. His model was small, with high back and belly, amber varnish, and clear though weak tone. Nicolo, his younger brother, made basses in preference to violins, and was his inferior. Andrea's sons, Antonio (1555-1638) and Geronimo (1556-1630), worked together much after their father's style. Geronimo also made instruments alone, of larger pattern, and changed the shape of the pointed sound-hole. Geronimo's son, Nicolo (1596-1684), was the most eminent of the family. His model is of extreme elegance. The corners are sharply pointed, the backs and bellies of beautiful grained wood, the sound-holes graceful and bold, the scroll of exquisite cut, and the varnish transparent and of a deep, rich hue. As a rule, he worked after a small pattern, but he produced some large violins, which are now called "grand Amatis" and are highly valued. He also made a number of beautiful tenors and violoncellos. His label reads: *Nicolaus Amati Cremonens. Hieronimi filius Antonii nepos fecit anno 16*—. Antonio Stradivari and Guarneri were his pupils, and the Jacobs of Amsterdam and Grancino of Milan were among his most successful imitators. With Geronimo (1649-1740), his son, the family of Amati ends. He followed their trade, but made indifferent instruments. For a further discussion of the family and their musical inventions, see under VIOLIN.

AMATITLÁN, ä-mä'tê-tlän'. A department, town, and lake of Guatemala, Central America. The town, the capital of the department, situated on the shores of the lake 12 miles southwest of Guatemala City, is also known as St. Juan de Amatitlán. It was founded by Jesuits, who formerly engaged here in extensive sugar-cane cultivation. The gathering of cochineal constitutes the chief industry, and there is trade in salt, raw silk, and fruit. Salt and alum wells and hot springs exist in the neighborhood. The lake has a length of 9 miles and an extreme breadth of 3. The population of the town in 1903 was 12,000; of the department, 35,387. A 1910 estimate returns the same figure for the town and 38,000 for the department.

AMATO, ä-mä'tō, PASQUALE (1878—). A distinguished baritone. He was born at Naples, and his parents expected him to follow the profession of a civil engineer. His remarkable voice showed itself very early, and he was frequently heard at amateur gatherings. Upon the advice of friends he entered the conservatory at Naples and took up singing seriously. After three years he made his début in 1900 at the Bellini Theatre as Germont in Verdi's *Traviata*. His reputation grew rapidly, and within two years he was one of the principal baritones of the Italian Opera at Buenos Aires. There Toscanini was so impressed with the young artist that he recommended him to Gatti-Casazza, who was then the director of La Scala in Milan. An engagement for Milan followed, but after a few appearances Amato suddenly lost his voice.

Gradually the voice came back. After some minor engagements at German theatres he returned to Italy, and in 1909 became a member of the Metropolitan Company of New York. Since then he has been heard in all the principal cities of the United States, where he is one of the most highly esteemed artists of the present day.

AM'ATON'GALAND. See TONGALAND.

AM'AURO'SIS (Gk. ἀμαύρωσις, a darkening, from ἀμαυρός, *amauros*, hardly seen, dim, obscure). A term applied to absolute blindness, often with no discoverable changes in the eye as, for example, in hysteria. It is also used to include all other cases of total blindness. The word is becoming obsolete. See AMBLYOPIA.

AMAURY, ä'mō'rê', or **AMALRIC**. The name of two kings of Jerusalem. 1. Amaury I was born in 1135 and reigned from 1162 to 1174. He was the brother of Baldwin III. In 1164, 1167, and 1168 he invaded Egypt, but was driven out by Saladin, who carried the war into Amaury's country in 1170. 2. Amaury II, born 1144, was King of Cyprus (1194-1205), and titular King of Jerusalem in 1197, but never made good his claim to the latter kingdom. He died at Acre in 1205. See Stevenson, *Crusaders in the East* (Cambridge, 1907).

AMAURY OF CHARTRES. See AMALRIC OF BÈNE.

AMAXICHI, ä'mäks-ê'kê, or LEVKAS. The capital of the Ionian island of Santa Maura, or Leucadia (Map: Greece, B 3). It is the residence of a Greek metropolitan and is built on the edge of the shallow lagoons which separate the northeast part of the island from the mainland, which narrows down from less than a mile in the north to 3500 feet. It has two harbors. Amaxichi derives its name from Gk. ἀμαξαι, *amaxai*, cars, which the Venetian garrison employed in bringing down oil and wine from the inland districts to the point nearest the fort of Santa Maura, where, subsequently, a settlement was made. Modern buildings are constructed of wood because of the frequency of earthquakes. There are numerous interesting ruins near by on the site of the ancient town of Leucas. Pop., 1896, 5868.

AMAXOSA. See ZULU.

AM'AZI'AH (Heb. whom Yahwe strengthens). Eighth King of Judah. He succeeded Joash (or Jehoash), and his reign may be fixed approximately at 796-777 B.C. Amaziah undertook two wars—against Edom and against Israel, respectively. In the first he is said to have been successful, despite the fact that he had dismissed his mercenaries and thus weakened his army (2 Chron. xxv. 10). The account, however, is not found in the earliest records. Edom was defeated in the Valley of Salt, and Selah, possibly the Petra of later times, was captured (2 Kings xiv. 7). Elated by his success, he challenged Joash, King of Israel, who accepted the challenge only when compelled to. Amaziah was defeated (2 Kings xiv. 12) and taken prisoner to his own capital. Amaziah survived his defeat by 15 years (2 Kings xiv. 7), when he was killed by conspirators at Lachish (2 Kings xiv. 19). The biblical narrator has a word of praise for Amaziah, because in punishing the murderers of his father, Joash, he did not harm the children of the conspirators (2 Kings xiv. 6). See the histories of Israel by Stade, Wellhausen, and Kittel (2d ed., 1909-12).

AM'AZON. A river of South America and

the greatest in the world, called by various names and, finally, by the explorer Orellana, who made the first descent from the Andes to the sea, named Amazon. This was derived from the well-known Amazon legend, which is claimed by some to have had also a native origin among the northern Caribs, but this is doubtful. Orellana found that in certain tribes the warriors were assisted in battle by the women, and undoubtedly from that fact he applied the Old World legend to them and consequently to the river. With the natives each section had its separate name; that is, each band or tribe named its own portion. One of its earliest names by the Spaniards was Marañon, now only applied to a part of its upper course (Map: South America, D 3).

The head waters of the Amazon, the Marañon, and the Ucayali rivers, rise in the central and northern Peruvian Andes, and after a northerly course parallel with these mountains unite in about long. 74° W., and the united waters pursue an almost easterly course between lat. 5° S. and the equator to the Atlantic, which is reached in long. 50° W., where this meridian intersects the equator. The Marañon, which rises in long. 76° 30' W. and lat. 10° 30' S., is properly the head stream of the Amazon, as it is farthest west; but the Ucayali is slightly the larger, and has its source farther south in the Andes in long. 72° W. and lat. 16° S. From long. 70° W., where the Amazon leaves Peru, its course is confined to Brazil.

The total length of the Amazon from the head waters of the Ucayali is about 3300 miles. It is between one and two miles wide where it enters Brazil, and gradually increases in breadth, enlarging to a width of 50 miles at its main mouth; and where it enters the sea the distance across it, from headland to headland, is fully 150 miles.

The total area drained by the Amazon is more than 2,500,000 square miles, a territory equal in extent to about 85 per cent of that of the United States (exclusive of Alaska), and embraces most of the South American continent west of long. 50° W. and between lat. 3° N. and lat. 17° S., except a comparatively narrow strip along the Pacific coast and a somewhat broader one on the Atlantic. The latitudinal zone drained by the rivers from the north averages only 6° or 7° in width, while that on the south has a breadth of 13° or 14°.

The chief rivers flowing into the Amazon from the north are the Napo, Putumayo, Yapura, and Rio Negro. These rivers flow in a direction more or less parallel with that of the Amazon, and thus they drain but a narrow longitudinal belt.

The chief affluents from the south (in addition to the Huallaga, an affluent of the Marañon, and the Ucayali) are the Javari, Juruá, Purus, Madeira, Tapajos, and Xingu. The Tocantins River practically belongs to this system of southern branches, being connected with the Amazon by an arm of that river, which cuts off the large island of Marajó.

The basin of the Amazon lies almost wholly within the belt of remarkably uniform equatorial heat, so that there is an uninterrupted plant growth throughout the year. There is a moderately heavy rainfall over the whole of the basin, except in the western part, where, east of the Andes, the rainfall is excessive; and higher up among the Andes, where it is deficient. The

very heavy rains in the upper waters of the basin are responsible for the enormous amount of water supplied to the river, which makes it (and its western tributaries) navigable to such a great distance from its mouth. In most sections there is a rainy season from January to May, and a six months' dry season from June to December. In the Upper Amazon valley the rainy season begins in November and continues until July, during which time the prevailing wind is northwest; but in the dry season the wind is chiefly from the southeast. The rainfall amounts to over 100 inches a year in this section.

The alternation of the rainy and dry seasons produces corresponding periods of high and low water in the rivers. Even in the Marañon a rise of 30 feet occurs in the wet season, and throughout the whole length of the Amazon during about half the year its waters are swollen and the adjoining low country inundated. These floods are not by any means of uniform magnitude, and at intervals of every few years abnormally high water occurs. The current of the Amazon averages about 2¼ miles per hour, but its velocity is much increased during the floods.

The drainage basin of the Amazon is remarkably level, and the slope from the outlying bounding highlands is very gradual. The height of land almost to the very sources of the branch rivers does not exceed 1000 feet, and as falls or rapids east of the Andes are almost unknown, these rivers are navigable for the greater part of their lengths. The Amazon and its tributaries form the most remarkable and extensive system of inland water highways in the world. The possibilities of future development in the chain of South American inland navigation are shown by the fact that on the north the Amazon has water communication with the Orinoco through the Rio Negro and the Casiquiare, while on the south the navigable waters of the Tapajos lack little of connecting it with the head waters of a tributary of the Plata River.

Within the basin of the Amazon there occur horizontal layers of argillaceous rocks and sandstone, which vary in height from 100 to 1000 feet. These and other deposits seem to indicate that at one time a local mediterranean sea covered the present Amazonian lowlands, and the Marañon had for its outlet into the western end of this sea a delta, which has gradually moved eastward as the shallow sea became filled up.

Not only the source streams, but nearly all the tributaries of the Amazon, experience a succession of falls where their waters enter upon the floor of the main stream, and some branches have falls higher up. Above these falls, which vary from a succession of rapids to falls of 50 feet or more, navigation is again resumed. On the Lower Amazon these rapids occur at a distance of from only 200 to 300 miles from the main stream; but the distance increases toward the west, so that on the Madeira and Rio Negro rivers the falls are far removed from the mouths, while most of the southern branch rivers west of the Madeira lie almost entirely within the unobstructed low belt.

Where the Amazon enters Brazil its elevation is less than 300 feet above sea level. Even at its low stage its usual depth in its lower course is about 150 feet, and in places it is said to be much deeper still. It has been estimated that

the Amazon discharges between 4,000,000 and 5,000,000 cubic feet of water per second; and with this enormous outflowing water there is carried every 24 hours a quantity of sediment sufficient to form a solid cube measuring 500 feet on each edge. In the flood season it rises in places 30 or 40 feet, and the villages, though built on posts, are frequently in such a state that a canoe can be paddled into the house. The entire country is inundated. The great rise begins in November and is highest in June, in which month there is nothing but water and trees everywhere along its banks and for many miles in each direction. Only the forest shows where the banks ought to be.

The Amazon is navigable by ocean steamers for a distance of 2300 miles, to Iquitos, and for smaller boats 486 miles beyond; but at the entrance to the gorges of the eastern Andes, navigation is practically suspended, on account of the rapids occurring there. Steamboat navigation began in 1853, but it was not until 1867 that the navigation of the river was thrown open to the world. Now lines of steamers ply from the mouth of the Amazon to various points above, Manãos, Remate de Males, Iquitos, etc. Vessels enter the Amazon through the estuary of the Para River, since the main mouth of the Amazon north of Marajo Island is shoal water filled with rocky islands. At the mouth there is a continual battling of the river current, the tides, and the winds. The tidal influence is felt up the river to a distance of about 400 miles. The tidal bore is at times so pronounced as to form successive walls of water 10 to 15 feet in height, which noisily sweep everything before them in their mad rush against the river current. The latter is perceptible at a distance of fully 200 miles seaward from the mouth of the river.

India rubber is the chief export from the Amazon basin, the finest quality coming from the Acre district. The trees from which the rubber is obtained grow wild in the dense forest, and rubber-hunting is a regular occupation. The importance of the Amazon as a highway of foreign commerce will become greater and greater as the economic development of Brazil proceeds, when in exchange for the ever-increasing quantities of tropical products exported, there will be returned the manufactures and products of the temperate zones.

Fauna. The Amazon valley is covered with thick forests of lofty growth, which are thinly inhabited by numerous independent savage tribes, some of whom are little known. They are armed with bows and arrows, with clubs, and with the long blow-gun with which they shoot needle-like arrows, tipped with the deadly Wourahli poison, which almost instantly paralyzes the victim. The animal life is exceedingly rich in numbers, but the flood conditions which so generally compel arboreal habits in unaquatic animals greatly limit at least the species of mammals. The principal animals are the tapir, jaguar, panther, cavy, armadillo, sloth, peccary, ant-eater, and monkey. Birds are exceedingly numerous; many of them are songless, but bedecked with gorgeously colored feathers; such are the humming birds and parrots. Among the snakes, the giant anaconda, or *sucuruju*, is the best known, and of the lizards the iguana attains formidable size. Numerous alligators and turtles, and the great water mammal, the manatee, frequent the river and its branches. Of

fishes there is a greater variety than in any other stream, and in fact a large proportion of the present known species are found in the Amazon. Insects exist in the forests in countless numbers. Neither the fauna nor the flora of the Amazon has been more than partly studied, and that mostly by visiting naturalists.

Flora. The flora of the immediate vicinity of the river is that which flourishes in a watery soil and which will survive the long-continued annual inundation which occurs in midsummer. There is no suspension of plant activity; leaves remain green throughout the year, and no month is without its bloom or fruit. Aquatic plants grow in great profusion and attain enormous size, a prominent example being the giant lily, *Victoria regia*. In the undergrowth occur rubias, myrtles, leguminosæ, epiphytic orchids, bromelia, and ferns.

The Amazonian forest presents to the river a wall-like frontage of trees, interwoven with vines and roots clothed and fringed with moss in the most fantastic manner. A continuous mass of verdure overhead has a secondary flora of its own. Some of the trees grow to a height of even 200 feet. The largest unexplored areas of South America are in the Amazon basin, and especially between the Tocantins and the Madeira rivers. The quest for rubber is rapidly revealing the untraversed tracts between the large tributaries. See BRAZIL.

Among the ports on the Amazon (from its mouth upward) are Macapá, Santarem, Obidos, Manãos, Teffe, and Tabatinga. The commercial outlet of the Amazon basin is Pará.

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AMAZONAS, ä'mä-zō'näs. A northern department of Peru. Area, 13,943 square miles. It is slightly mountainous and has a fertile soil, which produces tobacco and sugar-cane, while some gold is mined. In 1896 the population was estimated to be 70,676, but later figures are smaller because of a steady decrease in the birth rate. Capital, Chachapoyas.

AMAZONAS, or **ALTO AMAZONAS**. The northernmost and largest of the Brazilian states, bounded by British Guiana, Venezuela, and Colombia on the north, State of Pará on the east, Bolivia and the State of Matto Grosso on the south, and Colombia and Peru on the west (Map: Brazil, E 4). Its total area is 732,439 square miles. The surface, with the exception of a few mountain chains on the Venezuelan border, is one alluvial plain, covered with impenetrable forests, and intersected by the Amazon, with its numerous tributaries, including the Rio Negro and Madeira. The climate, although hot, is not unhealthful, and the soil is very fertile.

Industrially, the State is little developed, and its leading articles of trade are food products, principally coffee. With an area three and a half times as large as that of France, an abundance of fertile land, and excellent waterways, Amazonas had (1900) a population of 249,756, or about one inhabitant for three square miles. In 1908 one enumeration gave 280,000. Its capital and chief port is Mañaos. Amazonas originally formed a part of the State of Pará, and was constituted a separate State in 1850. Consult J. Verissimo, *Pará e Amazonas* (Rio de Janeiro, 1899), and C. L. Temple, *The State of Amazonas* (London, 1900).

AM'AZONITE, or AMAZON STONE. See MICROCLINE.

AM'AZONS, AMAZ'ONES (from Gk. Ἀμαζών, *Amazōn*). In early Greek legends, a race of warlike women, who either suffered no man to live among them or held men in servitude for the continuance of the race. The earliest accounts place them in Asia Minor, especially on the river Thermodon; later writers put them farther to the north and the west, in Scythia and the Caucasus; and finally we hear of Amazons in Libya, at the south of the known world. Their expeditions, undertaken for war and plunder, led them into Scythia and Syria, but especially to the coast of Asia Minor, where we find them in conflict with Priam, Bellerophon, and other heroes. In this region they were said to have founded many cities, notably Ephesus, where they established the temple of Artemis, which furnished them a refuge when they were defeated by Hercules. They were daughters of Ares and worshiped him and Artemis as their chief gods. They appear chiefly in three stories: (1) the killing by Achilles of their Queen Penthesilea, who led her army to the relief of Troy; (2) the conflict with Hercules, which arose from his endeavor to secure the girdle of their Queen Hippolyta, and led, according to some writers, to their annihilation; (3) the war with Athens, which began with the expedition of Theseus to carry off the Amazon Queen, and ended with their invasion of Attica, their attack on the Acropolis from the Areopagus (q.v.), and their total destruction by Theseus and the Athenians. The origin of these legends is not clear; but if we consider the localities in which the Amazons lived, and remember that in historic times the Greeks found tribes about the Black Sea in which the women held sway and took part in war, while in Caria, Lycia, and Lydia there is much evidence for descent traced through the mother, it seems not improbable that the Amazons embody a reminiscence of the people and the civilization which preceded the Greeks on the east of the Ægean, a civilization in which the women held the important place in state matters and in religion; the Amazons, then, reflect the goddess of this civilization. Representations of the Amazons are very common in all periods of Greek art. At first they appear in the costume of Greek hoplites, but later assume the Scythian garb. They are armed with lance, battle axe, or bow, and usually carry a crescent shield; one breast, the right, is commonly bare. Among the chief ancient representations are the reliefs from Gyölbashi, in Vienna, which seem to reflect the painting of Micon at Athens; and the friezes from Phigalia and the mausoleum at Halicarnassus, in the British Museum. Of the statues, three types go back to the best period of Greek art; the

"Wounded Amazon," in Berlin, probably by Polycleitus; the "Wounded Amazon" of the Capitoline Museum in Rome, and the "Unwounded Amazon" in the Vatican. It was said that, in order to be unimpeded in war, they burned off their right breasts; but no work of art surely shows them thus mutilated, and undoubtedly the story is merely an invention to explain a false etymology, as though the composition of the word "Amazon" were ἀ, priv., and μαζός, *mazos*, breast. Miss Bennett, in *American Journal of Archaeology* (1912), has suggested that a statue at Princeton represents an Amazon with mutilated breast. Consult Klügmann, *Die Amazonen in der attischen Litteratur und Kunst* (Stuttgart, 1875), and Corey, *De Amazonum Antiquissimis Figuris* (Berlin, 1891). For a very recent discussion of the Amazons and a good bibliography, see Florence M. Bennett, *Religious Cults Associated with the Amazons* (New York, 1912).

AM'BAKIS'TA. A Bantu tribe of Amboia, Portuguese West Africa. They were enterprising traders originally, but were ruined by the Portuguese and dispersed to other regions.

AMBALA, ūm-bā'lā, or **UMBALLA**. A city in India, capital of the district of Ambala in the Punjab (Map: India, C 2), and an important station on the Sindh, Punjab, and Delhi Railway, 150 miles northwest of Delhi. It is a large, walled town, in a level, well-watered, and cultivated country, and has an extensive trade. It contains a fine Gothic church, a Presbyterian church, dispensary, hospital, and leper asylum. The town was founded in the fourteenth century. Here, at a grand durbar, in 1869, Shere Ali, ameer of Afghanistan, concluded a treaty with Lord Mayo, Governor-General of India. Ambala is an important military station. Pop., 1901, 79,638; 1911, 80,131.

AMBALEMA, äm'bā-lā'mā. A city in the department of Tolima, Colombia, on the left bank of the Magdalena (Map: Colombia, B 2). The city lies 28 miles above Honda in the midst of an excellent tobacco-growing district and is one of the most modern as well as one of the most thriving towns of Colombia. It is noted for its manufacture of cigars. Pop., 1912, 6285.

AMBARI HEMP, äm-bä'rë. See HIBISCUS.

AMBARVA'LIA (Lat. *ambi*, round, about, and *arvum*, a field, arable land). Originally a religious procession round the land of the early Roman community, whose purpose was to purge the crops from evil influences. It was held annually, late in May. The main feature of the ceremony was known as the *Suovetaurilia*, because a pig (Lat. *sus*), a sheep (Lat. *ovis*), and a bull (Lat. *taurus*) were led all around the fields, driven by a crowd, whose members were garlanded and carried olive branches, and chanted as they moved. These three animals represented the farmers' most valuable possessions, and they were offered as the crops were ripening and in greatest danger from bad weather and diseases. After the animals had been led three times around the fields, they were sacrificed, and a prayer, which has been preserved in very ancient language, was offered to Mars, conceived of in his original function as a god of vegetation. The view of Mommsen, Heusen, and Jordan that this festival was identical with the Ambarvalia celebrated by the Arval Brothers (q.v.), has been questioned in recent years. Consult Fowler, *Roman Festivals* (London, 1899). See ROMAN FESTIVALS.

AMBARVA'LIS. See ARVAL BROTHERS.

AMBAS'SADOR (Med. Lat. *ambasciator*, agent, from *ambasciare*, to go on a mission, earlier *ambactiare*, from Lat. *ambactus*, vassal; according to Festus, of Celtic origin; compare Welsh *amaeth*, husbandman, and Goth, *andbahts*, servant; Ger. *Amt*, office). The highest rank of public minister accredited to a foreign court. Though used popularly and sometimes by writers on public law in a loose sense as the equivalent of minister (q.v.), the term is strictly appropriately used only of the highest of the four orders of diplomatic agents established by the Congress of Vienna in 1815 and that of Aix-la-Chapelle in 1818. The classification then adopted, which has been generally accepted, is as follows: (1) ambassadors, and legates and nuncios of the Pope; (2) envoys and ministers plenipotentiary; (3) ministers resident, accredited to the sovereign; (4) *chargés d'affaires*.

The ambassador is supposed to represent directly the head of his state, who signs his credentials, or letters of credence, and the ambassador therefore enjoys of right the privilege of personal communication with the sovereign to whom he is accredited. Ministers and *chargés d'affaires* do not, in theory, possess this right, though in the case of the minister, at least, the privilege is not usually denied. The *chargé d'affaires* is, in fact, not accredited to the sovereign, but to the minister of foreign affairs, and is regarded merely as an agent of his government to transact the business intrusted to him. Modern methods of carrying on the diplomatic intercourse of states have greatly diminished the relative importance of ambassadors, as compared with other diplomatic agents, and little remains of their primacy excepting a superior dignity and impressiveness and certain rights of precedence on ceremonial occasions. Prior to 1893 the government of the United States had been represented abroad by no agents of higher rank than ministers resident, who were, in the case of the great Powers, accredited as envoys extraordinary and ministers plenipotentiary. But in that year Congress passed an act authorizing the President to accredit ambassadors to certain European courts. Later the work of ambassador was conferred on the ministers to Mexico, Brazil, and Japan. The countries in which the United States was represented by ambassadors in 1913 were Austria-Hungary, Brazil, France, Germany, Great Britain, Italy, Japan, Mexico, Russia, and Turkey. The privileges and immunities of ambassadors are dealt with under DIPLOMATIC AGENTS. See also ASYLUM, RIGHT OF; EXTERRITORIALITY; LEGATION.

AMBATO, âm-bä'tô, or ASIEN TO DE AMBATO, â-syân'tô dâ âm-bä'tô. A town in the province of Leon, Ecuador, on the northeastern slope of Chimborazo, 78 miles south of Quito, and 8859 feet above sea level (Map: Ecuador, B 4). It was destroyed in 1698 by an eruption of Cotopaxi, but was rebuilt and flourished rapidly. It manufactures shoes and carries on an active trade in grain, sugar, and cochineal, which are produced in the surrounding region. In 1913 work was begun on the Ambato to Curaray Railway. This opens up a territory in the eastern part of the country which is rich in minerals, timber, and stock raising and agricultural advantages. Pop., about 10,000.

AM'BER (from Ar. *'anbar*, ambergris; called so from its resemblance to ambergris). A fossil resin of vegetable origin. It is usually of a

pale-yellow color, sometimes reddish or brownish; it is sometimes transparent, sometimes almost opaque. It occurs in round irregular lumps, grains, or drops; has a perfectly conchoidal fracture, is slightly brittle, emits an agreeable odor when rubbed, melts at 550° F., and burns with a bright flame and pleasant smell. Thales of Miletus was the first to notice that when amber is rubbed it becomes capable of attracting light bodies; this was the first electric phenomenon produced by man. An acid called succinic acid (named from the Lat. *succinum*, amber) is obtained from it by distillation. Amber had formerly a high reputation as a medicine, but the virtues ascribed to it were almost entirely imaginary. It is employed in the arts for the manufacture of many ornamental articles and for the preparation of a kind of varnish. Great quantities are consumed in Mohammedan worship at Mecca, and it is in great demand throughout the East. It was obtained by the ancients from the coasts of the Baltic Sea, where it is still found, especially between Königsberg and Memel, in greater abundance than anywhere else in the world. It is there partly cast up by the sea, partly obtained by means of nets, and partly dug out of a bed of carbonized wood. Limited quantities of it are found in the United States. It sometimes occurs in diluvial deposits, as in the gravel near London; but it is very rare in Great Britain. It is obtained in small quantities from the coasts of Sicily and the Adriatic, and is found in different parts of Europe, in Siberia, Greenland, etc. It sometimes incloses insects of species which no longer exist. Leaves have also been found inclosed in it. Specimens which contain insects or leaves being much valued, artificial substitutes are often manufactured and imposed upon collectors. According to an ancient fable, amber is the tears of the sisters of Phaëthon, who, after his death, were changed into poplars. The ancients set an immense value upon it. Pieces of amber have occasionally been found of twelve or thirteen pounds weight, but such pieces are extremely rare.

AMBER-FISH. Any of several carangoid fishes of the genus *Seriola*, numerous on both coasts of North America, which are of moderate size, graceful form, often brightly colored and excellent to eat. The commonest species of the Atlantic coast is *Seriola lalandi*. On the Pacific coast an allied species (*Seriola dorsalis*), the yellowtail, is highly valued as a food-fish and by anglers. For further discussion and illustration, see HORSE MACKEREL.

AMBERG, âm'bërk. The old capital of the Upper Palatinate in Bavaria, 35 miles east of Nuremberg and 32 north of Ratisbon (Map: Bavaria, D 4). It is situated on both sides of the Vils and is well built. The ancient walls are now transformed into shady avenues. Amberg is the seat of the court of appeal for the district, possesses a library of 34,000 volumes, a lyceum, an agricultural and industrial school, a municipal hospital, a house of correction, and numerous churches, among which St. Martin's, with a 300-foot tower, is especially noteworthy. There is located here a royal factory for the manufacture of small arms. The principal products are earthenware, woolen cloths, ironmongery, and beer. Some coal and iron is mined in the vicinity. Near Amberg Archduke Charles defeated the French under Jourdan on Aug. 24, 1796. Pop., 1890, 19,000; in 1900, 22,096; in 1905, 24,303; 1910, 25,222.

AMBERGER, äm'bĕrk-ĕr, CHRISTOPH (c.1500–c.1561?). A German painter of the Renaissance. The date and place of his birth are unknown, but he practiced chiefly at Augsburg, where he was active from c.1530. He developed under the influence of Hans Burgkmair and was affected by Venetian color. His portraits are characterized by a distinguished bearing and by a soft pictorial treatment. The most important are those of the Emperor Charles V (1532) in the Berlin Gallery, a young member of the Fugger family (1541) in private possession at Augsburg, and the geographer Sebastian Münster (1532), also in Berlin. His altarpieces are mannered and show greater Italian influence. By far the best is a triptych in the cathedral at Augsburg, dating from 1554 and representing the "Madonna with Angels Making Music," and wings representing Sts. Ulric and Afra. Consult his biography by Haasler (Königsberg, 1894).

AMBERGRIS, äm'bĕr-grĕs (Fr. *ambre gris*, gray amber; Ar. 'anbar). Also spelled *ambergrise* and *ambergrease*. A fatty secretion formed in the bowels of some sperm whales (q.v.) and valued as a material for perfume. It is taken from whales directly, but more often is found floating in waters (especially of the tropics) frequented by these cetaceans, or cast upon the beaches in lumps of all sizes up to a mass exceeding 200 pounds in weight. It is lighter than water, gray marbled with blackish in color, opaque and waxy in consistency, softens readily under heat, melting into resinous liquid at 145° F., and develops on exposure to the air a sweet, "earthy" odor in place of its disagreeable smell when first taken from a whale. Chemically, it is soluble in oils, but resists acids; and it dissolves readily in hot alcohol, yielding a substance termed "ambrein." As this is closely related chemically to known biliary secretions, it is further evidence that ambergris is of this nature, perhaps induced by, and partaking of, the squids upon which the sperm whale largely feeds, remains of whose beaks are frequently found mixed with it. Like other bezoars and substances of mysterious origin, ambergris was formerly regarded as an efficacious medicine, but its virtues were imaginary, and it is no longer used in pharmacy, nor as a flavor in cookery, except among a few barbarians of the East. It has a high commercial value, however, as a material for the manufacture of various perfumes, and the price is increasing, owing to the increasing rarity of the sperm whale and a growing demand. Hence it is adulterated and imitated; a test of its genuineness is described as "its solubility in hot alcohol, its fragrant odor, and its uniform fatty consistence on being penetrated by a hot wire."

AM'BER ISLANDS, or **ELECTRIDES**. In later Greek geography, the islands, famed for their amber, situated in the North Sea, from Denmark to the mouth of the Rhine. Also certain islands at the mouth of the legendary river Eridanus (the Po).

AMBERT, äm'bâr'. An ancient town in the department of Puy-de-Dome, France, 34 miles southeast of Clermont (Map: Southern France, H 3). It is situated 1730 feet above sea level and is on the Dore River. It contains a church of the fifteenth and sixteenth centuries, and the manufactures include lace, rosaries, paper, and ribbons. There is some trade in cheese. Pop., 1911, 7863.

AMBERT, JOACHIM MARIE JEAN JACQUES

(1804–90). A French General and writer. He was born at Chillas, near Cahors (Lot), and was educated at Saint-Cyr. He served in the Spanish and Belgian campaigns, distinguished himself in Algeria, and became Brigadier-General in Europe. He traveled extensively in Europe and America and for some time was a contributor to *L'Abeille*, a French journal published at New Orleans. Among his numerous writings are: *Etudes tactiques* (1865); *Histoire de la guerre de 1870–71* (1873); *Les soldats français* (1878–82); *Gaulois et germains, récits militaires* (1884–86).

AM'BER WITCH, THE. An English opera by W. V. Wallace, the text being by H. F. Chorley, first presented at Her Majesty's Theatre, London, Feb. 28, 1861. Its incidents are based on those of a German story by Meinhold (1843).

AM'BIGU'ITY (Lat. *ambiguus*, going about hither and thither, uncertain, doubtful). In law, the duplicity or uncertainty of meaning of a word, clause, or other part of a written instrument. The rule of evidence forbidding the admission of parol evidence to contradict, vary, or explain a written document is subject to the important exception that parol evidence may be introduced for the purpose of explaining an ambiguity in a written instrument. Lord Bacon's classification of ambiguities as "latent" and "patent" has been generally accepted by the courts, but has little importance. A patent ambiguity is one which appears on the face of an instrument without referring to any intrinsic fact or circumstance. Thus, if a testator after referring in his will to two persons named John, made a bequest to John, the term of the bequest would constitute a patent ambiguity. A latent ambiguity is one which is disclosed only by the proof of extrinsic facts. Thus, if a testator made a bequest to a person, naming or otherwise describing him, and it appeared extrinsically that there were two persons answering the description, the terms of the bequest would constitute a latent ambiguity. It is sometimes said that parol evidence cannot be introduced to explain a patent ambiguity. The statement is much too broad. In any case the underlying facts necessary to put the court in the position of the writer may be proven by extrinsic evidence, whereas direct evidence of intention, as declarations of intention by the writer, will be received, only in that kind of latent ambiguity known as an equivocation, where the name or description employed is equally applicable to two or more persons or things. See the authorities named under the titles **CONTRACT**, **WILL**, and **EVIDENCE**.

AMBI'ORIX. A chief of the Eburones in Belgic Gaul, who fought against Julius Cæsar in 54 B.C. By cunning and strategy he defeated one important Roman garrison under Sabinus and Cotta and massacred every man; but while on the march to another camp, he encountered Cæsar himself, who easily defeated him, though Ambiorix with a few men escaped into the forests.

AMBI'TIOUS STEP'MOTHER, THE. A tragedy by Nicholas Rowe, produced and printed in 1700. The scene is laid in Persepolis.

AM'BLER, JAMES MARKHAM MARSHALL (1848–81). An American surgeon, born in Fauquier Co., Va., and educated at the medical college of the University of Maryland. From 1874 to 1879 he was assistant and past-assistant surgeon, U. S. navy. He volunteered as

surgeon to the *Jeannette* Arctic expedition in 1879 (see DE LONG, GEORGE W.), and was in the first cutter with De Long when the officers and crew left the sinking vessel (June 13, 1881). His body was found March 23, 1882, and buried on Monument Hill, on the Lena Delta, where a pyramidal structure of stone and timber was erected to the memory of the explorers.

AMBLER. A borough in Montgomery Co., Pa., 16 miles northwest of Philadelphia, on the Philadelphia and Reading Railroad (Map: Pennsylvania, L 7). The region is chiefly agricultural, producing wheat, hay, rye, and dairy products. The borough has a Methodist Episcopal church which is celebrated for its beautiful stained-glass windows. There are many places of historic interest, notably, Fort Washington, General Washington's old camping ground, and the home of Gen. George Meade. At Ambler is located a very large chemical factory, and there is also a large asbestos, shingle, slate, and sheathing company. The town is a popular summer resort for Philadelphians. Pop., 1900, 1884; 1910, 2649; 1913 (est.), 4000.

AM'BLESIDE. A town in the heart of the English lake district, Westmoreland; a favorite resort for tourists on account of its scenery and its nearness to points of historic interest, the homes of Wordsworth, Dr. Arnold, and others. Fragments of Roman buildings have been found in the neighborhood. Stock Gill Force is a waterfall in the hills near the town. Pop., 1901, 2536.

AMBLETEUSE, ä'n'bl'tēz'. A seacoast village of France, in the department of Pas-de-Calais, on the English Channel, about 15 miles southwest of Calais and 6 miles north of Boulogne. It is famous as the landing place of James II, after his flight from England in 1689. There is a monument erected by Napoleon to the Grand Army in 1805. Pop., 1901, 685; 1911, 814.

AM'BLYO'PIA (Gk. ἀμβλυόπια, dim-sightedness, from ἀμβλύς, *amblys*, blunt, dull + ὤψ, *ōps*, eye). A name given to diminished acuteness of vision not relieved by the use of glasses and in many cases not accompanied by any visible ocular changes. The term is, however, sometimes more loosely used to include other forms of imperfect sight. Congenital amblyopia of one or both eyes is often due to hyperopia, myopia, or astigmatism. These prevent perfect vision, and although the use of proper glasses may eventually cause an improvement in young persons, this is impossible if the lack of proper vision has lasted long. Congenital amblyopia for colors (see COLOR BLINDNESS) may occur with a contraction of the visual field. Hysterical amblyopia, usually unilateral, may amount to total blindness. There is contraction concentrically of the field of vision for white and colors, and the fields for colors do not maintain the relative sizes which they normally possess. There are generally other hysterical symptoms. Simulated amblyopia is pretended blindness in one or both eyes. Toxic amblyopia is produced at times by large doses of quinine, or excessive and continual use of tobacco, alcohol, particularly wood alcohol, opium, and other drugs. If the drug is entirely given up recovery may occur after a long time. Malarial amblyopia of one or both eyes is usually relieved by quinine. Uræmic amblyopia sometimes appears suddenly in both eyes during an attack of uræmia, without retinal changes, though at times accompanying an albuminuric retinitis. It is generally

very transitory. *Amblyopia ex anopsia* is a term applied to partial or complete blindness in an eye from disuse, such as occurs in strabismus or squint. See SIGHT, DEFECTS OF.

AM'BLYOP'SIDÆ (Gk. ἀμβλύς, *amblys*, dull + ὄψις, *opsis*, the look, eyesight). A family of small fishes allied to the eyprinodonts mostly living underground and having their eyes in varying degrees of degeneration. See CAVE ANIMALS.

AMBLYP'ODA (Gk. ἀμβλύς, blunt + πούς, foot). An order of Eocene mammals, including all the short-footed, archaic ungulates. Four families are recognized—the periptychids, pantolambdids, coryphodonts, and uinatheres. The group was of Holarctic origin, and the most general character was the stumpy feet, furnished with five toes, supporting stout, pillar-like limbs. The earliest known forms were of medium size, and partly arboreal; later forms (Coryphodon) equaled small rhinoceroses in size, and were furnished with defensive canine tusks. They were feebly muscled, with short tail, clumsy feet, and of amphibious habits. Finally, the huge uinatheres became the dominant quadrupeds of the Middle Eocene. These great creatures had long narrow skulls with three pairs of horn-cores on the facial portion.

The group seems to have become suddenly extinct in the Upper Eocene. It is astonishing that these exceedingly clumsy and defenseless animals, handicapped by a most diminutive brain, should have survived and steadily increased in size throughout so long a period. We may attribute their extinction to either of two causes—either the low brain power which may have inhibited proper defense and care of the offspring, or the arrested development of the grinding teeth, which are neither larger nor more effective for the comminution of food in the gigantic uinatheres than in the much smaller coryphodon. For details, consult Cope, *Vertebrata of the Tertiary Formations of the West* (1884); Osborn, "Evolution of the Amblypoda," *Bull. Amer. Mus. Nat. Hist.* (1898); Matthews, "A Revision of the Puero Fauna," *id.* (1897); *Monographs of the United States Geological Survey* (Washington, 1884); Osborn, *The Age of Mammals* (1910).

AMBLYS'TOMA (Gk. ἀμβλύς, *amblys*, blunt, dull + στόμα, *stoma*, mouth). A genus of salamanders ranging over Mexico and the United States. They generally prefer damp climates, for the 15 or more species are grouped in the watered regions on either side of the arid plains. Only one species (*Amblystoma tigrinum*) ranges over all of the United States and into Mexico. The eastern examples transform early and while yet small. The larval or "axolotl" stage of the western forms grows large, transforms late, and may even become sexually mature while still bearing external gills. One Mexican form has never been observed to metamorphose. See AXOLOTL; SALAMANDER.

AM'BO (Lat. *ambo*, Gk. ἀμβων, from ἀναβαίνειν, to ascend). The pulpit or reading-desk used in the early Christian churches. There were usually two of them, placed on either side of the raised choir for the lower clergy, which occupied the upper part of the middle nave, below the altar. These ambones were entered from within the choir and stood on its outside edge, toward the aisles, connected with the encircling parapet or screen. They had usually a double staircase on either side and three levels

—the upper for the reading of the Gospels and for preaching, confessions of faith, and important ecclesiastical announcements; the middle one for the reading of the Epistles; the lower for other parts of the Bible. Usually one ambo was devoted to the reading of the Gospels, and near it stood the paschal candlestick, while the second ambo was for the Epistles. The earliest ambones are at Ravenna (cathedral and Sant' Apollinare). Those at Rome are mediæval (San Clemente, San Lorenzo), but are better preserved. They were of marble, merely carved in the earliest examples, inlaid with mosaics in later times. To the form with a single stairway the term "pulpit" is more appropriate. See PULPIT.

AMBOINA (Malay *Ambun*), APON, or THAU. The most important of the Moluccas, belonging to the Dutch, and lying southwest of Ceram and northwest of Banda. The island has an area of 264 square miles and is divided by the Bay of Amboina into two unequal peninsulas (Map: East India Islands, G 5)—Hitu the larger, and Leitimor, the smaller. The surface is irregular, highly mountainous, but fertile. There are many small streams which are not navigable. The soil is fertile and produces coffee, pepper, indigo, and rice. But the main product of the island is the clove, which grows there in abundance and constitutes the chief article of commerce. A great part of the island is covered with forests full of valuable woods. The inhabitants number about 39,000. They are physically and linguistically Malayan, although some Papuan admixture from Ceram has occurred. They have also Portuguese blood. Their language contains a considerable Portuguese element, and their religion is Protestantism (introduced by the Dutch), with the addition of rites and ceremonies borrowed from the Portuguese Catholics and inherited from their aboriginal past. The residency of Amboina comprises, besides the Amboina Island, the southern Moluccas, the Banda group, Ceram, Buru, Kei Islands, Aru Islands, and a few other islands, with a total area of 19,871 square miles and a population, 1905, of 299,004, of whom 2232 are Europeans and 1353 Chinese. The capital of the island and of the residency is Amboina. The history of Amboina is similar to that of the Moluccas, except for the massacre of the British settlers by the Dutch in 1623, for which the Dutch government was compelled by Cromwell in 1654 to pay the sum of £300,000, in addition to a small island, as a compensation to the families of the massacred. Consult: *The Barbarous Proceedings against the English at Amboyna* (London, 1651); Beaumont, *Dutch Alliances* (London, 1712); Verbeek, "Over de geologie van Ambon," in vols. vi and vii, *Koninklijke akademie van wetenschappen* (Amsterdam, 1899).

AMBOINA. The capital of the Dutch residency of that name (q.v.), situated near the middle of the northwest shore of Leitimor, one of the peninsulas of the island of Amboina, in the Moluccas in 3° 41' S. lat., and 128° E. long. It is well built, has wide streets, and contains a church, several schools, a hospital, and an orphan asylum. The government buildings are situated in Fort Victoria. The roadstead is spacious and affords safe anchorage. Fishing is the occupation of many inhabitants. The town suffered considerably during an earthquake in January, 1898. Pop., 1900, 7978.

AMBOINA WOOD. See KIABOUCCA.

AMBOISE, äN'bwäz'. A town on the left bank of the Loire, in the department of Indre-et-Loire, France. It is 15 miles by rail east of Tours and lies in a region so rich in vineyards that it has been called "the garden of France." The town has considerable steel and woolen manufactures, and trade in leather and cloth. It possesses a castle, in which several of the French kings have resided, and in which Charles VIII was born. The town owes much of its importance to the renown of the great churchmen and statesmen, Cardinal Georges and François Charles d'Amboise. It is memorable as the scene of the commencement of religious wars which devastated the kingdom during the sixteenth century, and where the word "Huguenot" was first applied to the Protestant party. The castle of Amboise was much improved by Louis Philippe, and was the residence of the Arab chief Abd-el-Kader during his captivity in France. Pop., 1901, 4538; 1911, 4660. Consult Chevalier, *Inventaire analytique des archives communales d'Amboise, 1421-1789* (Tours, 1874).

AMBOISE, äm'bwäz, AIMERIC D' (?-1512). A French Admiral. He was Grand Master of the Knights of St. John in Rhodes in 1503, and in 1510 he defeated the Sultan of Egypt in a sea fight.

AMBOISE, GEORGES D' (1460-1510). Cardinal and Prime Minister under Louis XII of France. He was born at Chaumont-sur-Loire. At a very early age he became almoner to Louis XI. It is generally stated that he became Bishop of Montauban at 14; later he was made Archbishop of Narbonne, in 1493 Archbishop of Rouen, and in 1498 Cardinal. Initiated in early years into the intrigues of the court, he soon, by his zealous services, secured the confidence of Louis of Orleans (Louis XII), by whom he was made Premier in 1498. From this time Amboise became the prime mover in all the political affairs of France. By his advice the King undertook the conquest of Milan, which had such great influence on the fortunes of France. After the death of Pope Alexander VI Amboise endeavored to get himself elected as Pope. At first he attempted to terrorize the conclave of cardinals by military force, but he was induced to dismiss his forces and then first Pius III—who occupied the papal chair only 27 days—and later Julius II were elected. Amboise was made Legate of France for life. Cardinal Amboise was a dexterous, experienced, and ambitious statesman. He governed France wisely, introduced reforms in the judicial system, reduced taxation and by his benevolence earned the respect of the whole nation. He died in Lyons, May 25, 1510, but his body was carried to Rouen, where his tomb is one of the striking features in the cathedral. Consult Legendre, *Vie du Cardinal d'Amboise* (Rouen, 1726), and Lavissee, *Histoire de France*, vol. v (Paris, 1903).

AM'BOY CLAYS. A great series of upper Cretaceous clay deposits found extensively developed in northeastern New Jersey, especially in the region around Perth Amboy, whence the name. The beds, which are of non-marine origin, are also known as the Raritan clays, because the Raritan River flows through the area in which they outcrop, and their total thickness, including the interbedded sands, is about 350 feet. A few of the beds contain an abundance of plant remains as well as some of mollusks. The Amboy clays are of great eco-

conomic value, being used in the manufacture of chinaware, firebricks, stoneware, brick, and tile. Large pits have been opened in the deposits at Perth Amboy, South Amboy, Woodbridge, and other points. The clays are used chiefly within the State, but large quantities are also sent to neighboring States. See CRETACEOUS SYSTEM; FIRECLAY; CLAY.

AMBOYNA. See AMBOINA.

AMBRACIA, ām-brā'shī-ā (Gk. Ἀμβρακία, *Ambrakia*). A Greek city in the southern part of Thesprotia, in Epirus, on the Arachthus River, about 10 miles from its mouth. It was colonized by the Corinthians, under the leadership of Gorgus, son of Cypselus, in the latter half of the seventh century B.C., and soon rose to a position of great wealth and power. Later, it came under Macedonian control. Pyrrhus of Epirus received it from Cassander as a reward for help against his brother Antipater; he made it his capital and enriched it with many public buildings and works of art. The latter were removed and carried to Rome when the town was taken by the Romans in 189 B.C. After Augustus, in 31 B.C., transferred the inhabitants of Ambracia to the newly founded city of Nicopolis, Ambracia sank into insignificance. The modern town is Arta. See Oberhammer, *Akarnanien, Ambrakia, Amphilochien, Leukas im Altertum* (Munich, 1887); Leake, *Travels in Northern Greece*, vol. i, pp. 205 ff. (London, 1835).

AMBRA'CIAN GULF. See ARTA, GULF OF.

AM'BREE, MARY. The subject of a ballad included in Percy's *Reliques of Ancient English Poetry*; a woman who, to avenge the death of her lover, is said to have disguised herself as a soldier and fought against the Spaniards at the siege of Ghent in 1584. Though unknown in history, she is frequently alluded to by the poets, especially by Ben Jonson, who refers to her in his *Epicæne* (iv, 2), *Tale of a Tub* (i, 2), and *Fortunate Isles*; by Fletcher, in his *Scornful Lady* (Act v); and by others of the period, to whom she became a sort of typical virago.

AMBRIDGE. A borough in Beaver Co., Pa., 16 miles northwest of Pittsburgh, on the Pennsylvania Railroad and the Ohio River (Map: Pennsylvania, A 6). The industries of the borough include bridge building, metal molding, and the manufacture of tubes. The water works are owned by the municipality. Pop., 1910, 5205; 1913 (est.), 8000.

AMBRIZ, ām-brēz'. A seaport town, the capital of a district of the same name, in Portuguese Angola, West Africa. It is 70 miles north of Loanda, at the mouth of the Loje River, and has a large export trade in coffee, ivory, and gums. Extensive copper deposits exist in the district. Its occupation dates from 1855. Pop., 2500.

AMBROGIO IL CAMALDOLESE, ām-brō'-jō ēl kā-māl'dō-lā'zā (properly AMBROGIO TRAVERSARI) (1378-1439). An Italian humanist and Greek scholar, born in the Romagna. He early entered the Convent degli Angeli at Florence, studied the Greek ecclesiastical writers in the original when a knowledge of Greek was rare even among scholars, and in 1431 was appointed Director-General of the Camaldolese Order by Eugenius IV. A member of the circle which Cosimo de' Medici had assembled at Florence for the restoration of the studies of antiquity, he prepared at his request a translation of

Diogenes Laërtius. Symonds refers to him as a "little, meagre, lively, and laborious man."

AMBROS, ām'brōs, AUGUST WILHELM (1816-76). One of the greatest authorities on the history of music. He was born at Mauth, near Prague, and received his education at the gymnasium and University of Prague. In 1840 he entered the office of the Attorney-General, where his exceptional ability was soon recognized, so that in 1850 he was appointed Attorney-General. Decided musical ability manifested itself very early, but his parents obstinately refused to have this talent cultivated. Nevertheless he secretly studied piano and composition with such success that he repeatedly appeared in public as a pianist. His compositions include several overtures, a *Stabat Mater*, two Masses (in B flat and A minor), a national opera, *Bretislav a Jitka*, and numerous pieces for piano. These are well written, and betray the influence of Schumann. In 1872 he received an appointment at the Ministry of Justice in Vienna and a professorship at the Conservatory. He first attracted attention by his *Grenzen der Poesie und Musik* (1856), a reply to Hanslick's *Vom Musikalisch Schönen*, which had appeared two years previously. In 1860 he published his important *Kulturhistorische Bilder aus dem Musikleben der Gegenwart*. Under the pseudonym "Flamin" he contributed many excellent criticisms to Schumann's *Neue Zeitschrift für Musik*. His great fame, however, rests on his *Geschichte der Musik*, which he began in 1860. It is entirely the result of original researches. In the accomplishment of this difficult task he had the hearty coöperation of the government and the Viennese Akademie, the former granting him extended leaves of absence and the latter substantial funds. In his quest for materials he ransacked the rich libraries of Vienna, Venice, Rome, Bologna, Florence, Naples, and Munich. Unfortunately he died before the completion of the fourth volume, which treats of Palestrina and the beginning of dramatic music. The work was completed by F. W. Langhans (q.v.) under the title *Geschichte der Musik des 17, 18 und 19 Jahrhunderts* (1882-87). The original four volumes have been revised by Sokolowsky, Reimann, and Leichtentritt, who have made use of the most recent investigations up to 1911.

AMBROSE (fl. 1190). A Norman poet and chronicler. He is known through his work called *L'Estoire de la guerre sainte*. This manuscript, discovered by Gaston Paris, describes in verse the adventures of Richard Cœur de Lion as a crusader in the Holy Land in 1190-92. Consult Gaston Paris's edition of the poem in his *Collection des documents inédits sur l'histoire de France* (1897).

AMBROSE. A swindler in Lesage's *Gil Blas*, who, in league with a young man and women, all disguised, entices Gil Blas into a house which the girl says is hers. Here they relieve him of his ring and his money. They then decamp, and he finds out that the house is only a hired lodging.

AM'BROSE, SAINT (c.340-397). One of the most celebrated of the ancient Fathers of the Church and one of the four doctors of the Western church. He was born at Trèves, where his father, as Prefect of Gaul, was wont to reside. According to his earliest biographer, Ambrose received a fortunate omen even in his cradle: a swarm of bees covered the slumbering boy, and the astonished nurse saw that the bees

clustered round his mouth without doing him any harm. His father, perhaps remembering a similar wonder related of Plato, foretold from this a high destiny for Ambrose. He received an excellent education in Rome with his brother Satyrus, who died early, and his sister Marcellina, who became a nun. Ambrose studied law and entered the civil service, and soon distinguished himself so much that he became, about 370, a consular magistrate in Upper Italy, with his court at Milan. In this office his gentleness and wisdom won for him the esteem and love of the people, whose prosperity had been much injured by the troubles caused by Arianism. Accordingly he was unanimously called, by both Arians and Catholics, to be Bishop of Milan in 374. He long refused to accept this dignity and even left the city; yet he soon returned, was baptized, as hitherto he had been only a catechumen, and was consecrated eight days afterward. The anniversary of this event is still celebrated as a *fête* by the Catholic church. As a bishop, Ambrose won universal reverence by his mild and gentle, though, toward wickedness of every kind, severe and unbending character. Thus he defended the churches of Milan against the proposed introduction of Arian worship by the Empress Justina (385–386), and brought to repentance and public penance the Emperor Theodosius himself, who had caused the rebellious Thessalonians to be cruelly massacred by Rufinus (390). He is best remembered, however, not as the faithful bishop and wise counselor, nor as the fluent preacher and learned theologian, but as the sympathizing friend of Monica, the mother of Augustine, when she deplored his rejection of orthodox Christian teaching, and as the one whom Augustine heard with pleasure and who received him into the Church. Ambrose died in Milan, April 4, 397. The Ambrosian ritual has also received his name only because Ambrose had made some changes in it, which are retained at the present day in the Milanese church. A commentary on the Epistles of Paul, which was formerly ascribed to Ambrose, is now frequently ascribed to the Roman deacon Hilarius, and is usually quoted as the "Commentary of the Ambrosiaster." Ambrose is the patron saint of Milan, and the large Ambrosian Library (q.v.) received its name in honor of him. The best edition of his works, in which he followed in many things the Greek theological writers, is that published by the Benedictines (2 vols., Paris, 1686–90), reprinted in Migne, *Patr. Lat.*, xiv–xvii, later edited by Ballerini (6 vols., Milan, 1875–86); by C. Schenkle in *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1896 sqq.); English translation of some of his principal works by H. de Romestin (New York, 1896). For his biography, consult Barry (London, 1896). His fifteenth centenary was observed in Milan in 1897. Consult *Il Quindici Centenario della morte di S. Ambrogio* (Milan, 1897).

AM' BROSE'S TAV' ERN. An old tavern in Edinburgh, noted as the scene of the *Noctes Ambrosianæ* (q.v.) by Christopher North (John Wilson). It is no longer standing; its site is occupied by the new register house.

AMBRO'SIA, ām-brō'zhī-ā (Gk. ἀμβροσία, from ἀμβροτος, *ambrotos*, immortal, from ἀ, *a*, priv. + βροτός, *brotos*, for *μροτός, **mrotos*, mortal). In the classical mythology, with *nectar* (q.v.), the food and drink of the gods. The word is etymologically identical with the Sanskrit *a-mṛta*,

immortal, drink of immortality, and the same root appears in the Latin, *im-mortalis*. Properly, then, *ambrosia* denotes merely immortality, the natural element, the natural sustenance of gods. Naturally, therefore, the gods not only ate ambrosia, but also bathed and anointed themselves with it; and the adjective *ambrosial* may be applied to any of their possessions. Without ambrosia the gods lose their strength; if given to mortals, it confers ageless immortality. It also preserves bodies from decay. The conception of the nature of ambrosia varied, according to its use. As a food, it was like bread; as nectar, like wine. In some of the later writers, nectar becomes the food and ambrosia the drink of the gods. This variation is natural enough, since originally ambrosia and nectar were identical.

AMBRO'SIA BEE'TLES. Beetles of the family Scolytidæ, which differ from the bark-borers by pushing their galleries deeply into timberwood and feeding upon a substance called "ambrosia." They include the genera *Xyleborus*, *Platypus*, *Corthylus*, and their allies, and are common and often injurious throughout North America. All are very small, elongate, compact beetles, of the form shown in the illustrations of their work on the Plate illustrating ARMY-WORM and AMBROSIA BEETLES, and their cylindrical galleries rarely exceed a tenth of an inch in diameter. These galleries penetrate the solid wood deeply, ramify widely, are uniform and free from dust, and have many short branches, serving as brood-cells; their walls are stained, and the perforations and stain injure the wood for many uses, although not sufficient to harm the life of the tree perceptibly. The most interesting feature of their history is the care given to their young, and the cultivation of fungi—acts unique among beetles, and comparable to those of the social hymenoptera. Habits and methods vary among the different genera, but in general are as follows: Within their galleries is found a substance, taking various forms, most usually that of a cluster of chains of beads, which has been named "ambrosia," and which is shown by the microscope to be a fungus. This fungus is succulent, and forms the food of the insects and their young, and it is planted and cultivated by these beetles, which regard its safety with the apparently anxious solicitude that bees feel toward their stores of honey food. It is started by the mother insect upon a carefully prepared bed of wood dust, some species devoting special chambers to this purpose, others starting a bed anywhere near the larvæ, using the excrement of the larvæ as an aid to its propagation. Sap must be present, however, in order to secure its growth, and in most species the sap must be in a condition of fermentation. Then the fungus must be eaten as it grows—kept grazed down—or it will ripen, emit spores, and choke up the tunnels. All these difficulties are so well met by these minute gardeners that many generations in succession sometimes inhabit and continue to enlarge their system of galleries. These are sometimes bored in vigorous timber, but more often in weak trees, and dead wood is sometimes occupied, certain species exhibiting a special predilection for the staves of wine casks. A full treatment of this group and their customs and effects has been given by H. G. Hubbard, *United States Department of Agriculture*, new series, *Division of Entomology. Bulletin No. 7* (Washington, 1897).

AMBRO'SIAN CHANT. The choral music

of the early Christian Church, introduced from the Eastern church into the Western by St. Ambrose, Bishop of Milan, in the fourth century. About the real character of this music little is known. It resembled the Gregorian chant, which did not replace it, but was only a general revision of it. It has been stated that St. Ambrose adopted the four authentic modes (see *MODES*) from the Eastern church. Although it is probable that he did so, the point has not yet been established by positive evidence. That even after the Gregorian revision the Milan liturgy retained some special characteristics, we learn from the statements of some mediæval writers; but what these peculiarities were we do not know. Proof is wanting that the famous "Ambrosian Hymn," *Te Deum laudamus*, was composed by St. Ambrose; it seems probable that this melody was also taken over from the Eastern church. Consult: Camilla Perego, *Regola del canto Ambrosiano* (Milan, 1862); A. W. Ambros, *Geschichte der Musik*, vol. ii (Breslau, 1862-82); G. M. Dreves, *Aurelius Ambrosius, der Vater des Kirchengesanges* (Freiburg, 1893); F. A. Gevaert, *La Mélodie antique dans le chant de l'église latine* (Ghent, 1895); G. Houdard, *La Cantilène Romaine* (Paris, 1905); P. Wagner, *Ursprung und Entwicklung der liturgischen Gesangsformen bis zum Ausgange des Mittelalter* (Leipzig, 1910); E. Garbagnati, *Rivista sulantica salmodia ambrosiana* (Rome, 1912); A. Steier, *Untersuchungen über die Echtheit der Hymnen des Ambrosius* (Leipzig, 1903).

AMBROSIAN LIBRARY. A famous library in Milan, so named in honor of St. Ambrose, the patron saint of the city. It was founded in 1609 by Cardinal Federigo Borromeo, who, in 1609, formally opened it to the public. The library contains upward of 230,000 printed volumes and 8400 manuscripts, some of them of great value. Among the latter the chief treasures are a Greek Pentateuch of the fifth century; several palimpsest texts, including an early Plautus; fragments of Ulfilas's Gothic translation of the Bible; the celebrated Codex Atlanticus, containing original drawings and MSS. by Leonardo da Vinci, and a copy of Vergil with marginal notes by Petrarch. The library possesses a small but excellent collection of paintings, including Raphael's cartoon for the "School of Athens," and the celebrated portrait of Bianca Sforza by Ambruogio da Predis.

AMBROSIAS'TER. The name by which the unknown author of the *Commentaria in xiii Epistolas beati Pauli* is known. The use of this name is due to the fact that from the middle of the ninth century to the time of Erasmus this work was generally ascribed to Ambrose of Milan. This authorship Erasmus held to be doubtful—a position which is confirmed not only by the lack of all external evidence in its favor, but by definite internal evidence against it.

Owing to the citation by Augustine of a passage from these Commentaries as by St. Hilary, it has been thought by some critics that they are to be identified with the lost commentary of Hilary of Poitiers on the Epistles. Others in turn have ascribed them to well-nigh every Hilary of antiquity.

In 1899 Dom Morin, in the *Revue d'histoire et de littérature religieuses*, suggested that they were the work of Isaac, a professed convert from Judaism, who was exiled to Spain in 378-380 and is said thereupon to have re-

lapsed to his former faith. This view Morin later withdrew in favor of an authorship by Decimus Hilarianus Hilarius, proconsul of Africa in 377. As between these two views modern scholars are somewhat divided, though they are one in attributing to the author of the Commentaries the pseudo-Augustinian work known as *Quæstiones ex utroque testamento*.

However the authorship of these two works may be decided, it is acknowledged that the Commentaries give perhaps the most sane, lucid, and thoughtful exposition of the Pauline Epistles previous to the Reformation, while the Questions constitute the earliest presentation which we have of biblical difficulties. See Souter, *A Study of Ambrosiaster* (1905); Turner, in *Journal of Theological Studies* (April, 1906).

AMBRO'SIO, or THE MONK. A romance by M. G. Lewis (hence known as "Monk" Lewis), first published in 1795. The hero is a Capuchin abbot of Madrid, who loses his character and is condemned by the Inquisition, but saves himself for a time by a compact with Lucifer.

AM'BROTYPE (Gk. ἀμβροτος, *ambrotos*, immortal + τύπος, *typos*, impression). An early form of positive photograph on glass, similar to the daguerreotype. It consisted of a thin collodion negative backed with a black surface and viewed by reflected light.

AM'BRY, AUMERY, or ALMERY (OF. *almarie*, Fr. *armoie*, from Lat. *armarium*, a closet, chest; for the *b*, see ALHAMBRA). A niche in the wall of a church shut in by a door, or a small cabinet of wood by the altar, holding the vestments and utensils for the mass. In monastic buildings ambries were presses, or even store-rooms or pantries, used for keeping plate, hanging towels, and the like.

AM'BULANCE (Fr. *hôpital ambulant*, walking hospital, from Lat. *ambulare*, to walk). A two- or four-wheeled wagon constructed for conveying sick or wounded persons. Ambulances are constructed to run very easily and are designed to carry one or two tiers of stretchers. Some forms are fitted with water-tank, medicine chest, operating-table, and other conveniences. City hospital ambulances are light, four-wheeled wagons furnished with one or two beds, surgical appliances, and restoratives. Since 1899 electric automobile ambulances have been used by the larger hospitals in the larger cities of the United States. A surgeon rides in the ambulance, and in crowded streets a gong is kept sounding in order that the ambulance may have the road cleared. Ambulances used in the army are large spring wagons provided with all the necessary appliances for the care and transportation of the sick and wounded. In each division of the army these wagons are organized into a corps and placed under the command of an ambulance officer. Railway cars and steamers are also fitted up with conveniences for transporting patients to more remote and permanent hospitals. The system perfected in this country during the Civil War has now been adopted by most of the civilized nations. We find something like an ambulance service, however, introduced into the French army as far back as 1792, by Baron Larrey, whose *Ambulances volantes*, or 'flying field hospitals,' were used to attend the wounded and remove them promptly from the scene of action. Shortly afterward Baron Percy organized a corps of *brancardiers*, soldiers equipped with first-aid appliances and stretchers,

who were trained to collect the injured while fighting was going on and carry them outside the zone of hostilities. The Geneva Convention of 1864 favored the extension of ambulance service in war, and the modern Red Cross service may be said to date from that time. Several of the continental countries keep permanently in reserve railway trains completely equipped for hospital service. In France an ambulance is a portable hospital attached to every division of an army in the field and provided with all the requisites for the medical succor of sick and wounded troops. Such an ambulance is stationed at some spot removed from immediate danger, and soldiers after a battle seek those who have been wounded and convey them to the ambulance. The French also introduced the *cacolets*, which consist of two easy-chairs slung in panniers across the back of a mule, which are available along paths where no wheel-carriage could pass. The *cacolets* have since been adopted by other armies, as well as improved hand-litters, and wheeled litters or barrows.

AMBULANCE CORPS. See HOSPITAL CORPS.

AM'BULATORY (from Lat. *ambulare*, to walk). In mediæval architecture, any covered walk or passage, such as the arcades of a cloister (see MONASTERY). More specifically, the aisle around the apse at the east end of a church, connecting the north and south aisles of the choir; called also *deambulatory*. The earliest example was probably that of the original place of St. John Lateran at Rome (fourth century). The cathedrals of Paris and Chartres have double ambulatories. See APSE.

AM'BUSCADE' (from Low Lat. *imboscare*, to ambush, from *in*, in + *boscus*, bush, wood). A device of military strategy often employed in ancient and mediæval warfare; now, owing to the changed conditions of fighting, rarely possible. Originally it had special reference to bodies of men "concealed in a wood," as its name implies. The only modern instance of the use of this particular device occurred at the battle of Santiago, during the Spanish-American War of 1898, when effective damage was inflicted on the American attacking forces by Spanish sharpshooters hidden in the dense foliage of the trees. Ambuscade must not be confounded with AMBUSH, which see.

AM'BUSH (for derivation, see AMBUSCADE). A strategical device, enabling one force successfully concealed to surprise, defeat, or capture another. It is probably the one element of strategy that time has never changed; for notwithstanding the transformation that has taken place in the general science of warfare, the ambush with all its variations of form and method still remains. An ambush may be on any scale, from the surprise and capture of a small reconnoitring patrol to the defeat of an army. In the latter case it occasionally is described by a more ambitious title by some European authorities, but such is the exception rather than the rule. Every campaign that history has recorded gives incident after incident of the more or less successful practice of this particular form of strategy; but it has been left to the Anglo-Boer War of 1900-01 for its highest and most successful development. In this campaign the Boers practically owed nearly every success to the use of the ambush in one form or another; a typical example was encountered in General Roberts's

campaign. During his march to Bloemfontein a strong detachment of Boer troops, under Gen. Christian De Wet, cleverly concealed themselves among the rocks and kopjes at a place called Sannahspost. A convoy of 128 wagons, carrying valuable supplies and munitions of war, together with their escort, walked unsuspectingly into the trap, and were captured without the firing of a shot or the showing of a single man other than De Wet himself. A body of 200 volunteer horse, sent from the main column to ascertain the whereabouts of the convoy, were similarly captured, and on attempting to escape were practically annihilated by their unseen enemy. Consult Conan Doyle, *The Great Boer War* (London, 1901).

AMEER'. See EMIR.

AM'ELAN'CHIER. A genus of plants of the family Rosaceæ, related to the apple, and distinguished by an ovary having twice as many cavities as styles. It consists of about 25 species of shrubs or trees with simple leaves, abundant racemes of white flowers, and soft, juicy, and agreeable fruit somewhat larger than a pea. About 18 species occur in North America, and they have received such names as Service or Sarvos berry, June berry, shad bush, May cherry, sand cherry, etc. See Plate of SPIRÆA.

AMELIA, à-mā'lê-à (ancient *Ameria*). A city of central Italy, in the province of Perugia, 21 miles southwest of Spoleto. It has been the seat of a bishop since 340 A.D., and has a cathedral. Remains of great polygonal walls show that it was once of some importance, but in the days of Republican Rome it is known chiefly as the birthplace of Sextus Roscius Amerinus, in whose defense Cicero delivered a speech. It claims to be 400 years older than Rome. Pop., 1901, 6246 ; 1911, 10,124.

AME'LIA. A novel by Fielding, published by Millar, who is said to have paid £1000 for the copyright, Dec. 19, 1751. Two editions were called for on the day of publication. Much of the story is autobiographical, some of the adventures of the hero, Booth, recalling incidents in the author's earlier life in the country, while the title-character was largely suggested by the personality of Fielding's first wife. The book was a great favorite with Dr. Johnson. Consult Piozzi, *Anecdotes of the Late Samuel Johnson*, LL.D. (London, 1786).

AMELIA ISLAND. A small island off the east coast of Florida, opposite the mouth of St. Mary's River (Map: Florida, G 1). It was settled by General Oglethorpe in 1736, and in 1739 it was the scene of the first bloodshed in the war between Spain and England, a party of Spaniards killing two unarmed Highlanders. After 1808 the island, then a part of Spanish East Florida, was a notorious resort for pirates, smugglers, and slave-traders. In March, 1812, it was captured by rebels against Spain and immediately handed over to the United States; early in 1813 the United States troops stationed here were withdrawn, and in 1817 the island was captured by a filibustering expedition, while later in the year a Mexican force took temporary possession of it in the name of Mexico. The United States again occupied it in 1818 and held it in trust for Spain until she acquired the Floridas by the treaty of 1819. Consult McMaster's *History of the People of the United States*, vol. iv (New York, 1893-1900).

AMELIE-LES-BAINS, à'mâ'lê'lâ'bân' (Fr. 'watering place of Amelia,' wife of Louis Phi-

lippe), formerly called Arles-les-Bains. A famous watering place and summer resort in France, situated in the department of Pyrénées-Orientales, at the confluence of the Tech and the Mondony, at an altitude of nearly 800 feet above sea level (Map: France, S., G 6). It has 30 copious sulphur springs, with a temperature from 63° to 145° F., the waters of which are used both externally and internally. It contains a very large military hospital and numerous remains of Roman thermæ. Pop., 1901, 1340; 1906, 1328; 1911, 1383.

AMELOT DE LA HOUSSAYE, äm'lö' de lä öö'sä', ABRAHAM NICOLAS (1634-1706). A French historian, who was made a prisoner in the Bastille by order of Louis XIV. He published a *History of the Government of Venice*, translations of Machiavelli's *Prince*, of Tacitus's *Annals*, and of Sarpi's *History of the Council of Trent*, the notes to the last of which, written by himself, gave great offense to the advocates of the unlimited authority of the Pope. Voltaire speaks of his histories as very good and of his memoirs as very faulty.

AMEN (Heb. 'it is firm,' hence 'surely,' 'verily,' transliterated into Gk. ἀμήν, *amēn*, Lat. *amen* and so in later versions). A word expressive of assent or affirmation. It is sometimes used at the beginning of a sentence referring back to words of a preceding speaker, e.g., 1 Kings, i. 36; Jer. xxviii. 6. The meaning then is 'let it be so.' This is also the usual rendering of the word in the Greek Old Testament, γένοιτο, *genoito*, 'let it be.' Sometimes it is detached, nothing following, with the same significance, e.g., Deut. xxvii. 15-26; 1 Chron. xv. 36, identical with Ps. cvi. 48, shows its liturgical use c.200 B.C. In Isa. lxxv. 16 we should probably read *omen*, and not *amen*; consequently 'the God of Truth,' as in Isa. xxv. 1. Jesus seems to have used the term adverbially—'verily,' 'of a truth.' It occurs more frequently in the Gospel of Matthew, which stands nearest to the lost Aramaic gospel, than in the other Synoptics. There is no parallel to this usage in Talmudic literature. It may be a manner of using the term peculiar to himself or to the Galileans of his day. The author of the Fourth Gospel observed it and doubled it, probably to give it a mystic significance. In Rev. iii. 14 Jesus is himself called ὁ ἀμήν, *ho amēn*, 'The Amen,' and the name is explained as 'the faithful and true witness,' which shows that words employed in the liturgy were often but vaguely understood, even when the root idea of the word was known. See H. W. Hogg, in *Jewish Quarterly Review*, p. 1 (1896); Dalman, *Die Worte Jesu*, pp. 185 ff. (1898).

AMEN, HARLAN PAGE (1853-1913). An American educator. He was born at Sinking Spring, Ohio, and graduated at Harvard University in 1879. In 1895 he became principal of Phillips Exeter Academy, which under his management continued to hold its place as one of the foremost educational institutions in the United States.

AMENDE HONORABLE, ä'mänd' ö'nö'rä'bl' (Fr. honorable amends, satisfactory reparation). Formerly an infamous punishment to which criminals were condemned who had offended against public decency or morality. It was first introduced in France in the ninth century and remained in force there until formally abrogated in 1791. It was restored as a punishment for sacrilege in 1826, but disappeared

finally in 1830. It consisted of a confession made by a bareheaded and kneeling criminal in open court, conducted thither with a rope around his neck by the common hangman. In popular language, the phrase now denotes a public re-antation and reparation to an injured party for improper language or treatment, or is still further extended to mean an apology of any kind, an "honorable compensation" for insult or injury.

AMENDMENT. A term used with reference both to legislative action and parliamentary and judicial procedure. Amendment in legislation is the alteration of an existing statute by means of a new legislative enactment which may expressly refer to and modify the earlier law, or which by reason of its inconsistency with the earlier law may impliedly modify its scope or meaning. In general there is no limitation upon the power of legislative bodies to amend or repeal existing laws, except the provisions of the constitution to which the legislative body is subject. The British Parliament, being itself the constitution-making body, has unrestricted power to amend and repeal existing laws. In the United States Congress has power to repeal laws of the United States, but it has no power to amend the provisions of the Constitution. The method of amending the Constitution of the United States is provided by Article V of that instrument, but the exercise of this power is limited by the provision "that no State without its consent shall be deprived of its equal suffrage in the Senate." The United States Constitution contains no provision directly limiting the power of the State legislatures to repeal the statute law of the several States; but Article I, Section 10, providing that "No State shall pass any law impairing the obligation of contract," amounts to a restriction on the power of the State Legislature to repeal statutes which are in effect contracts with the citizen of the State. This construction was first established in the celebrated Dartmouth College case (q.v.). The several State constitutions may also, and frequently do, limit the power of the Legislature to amend or repeal existing laws. See CONSTITUTIONAL LAW; ABRIGATION.

Amendment in parliamentary procedure is used in order to vary or to qualify a motion, bill, or resolution before the House. Amendment is usually offered by means of a motion, and when adopted in accordance with the rules of parliamentary procedure becomes a part of the original motion or bill, which may then be voted upon. In the case of bills before legislative bodies amendment is not infrequently a method of changing the entire scope and meaning of a bill or of dismissing it from any further consideration. See PARLIAMENTARY LAW, and the authorities there referred to.

Amendment in the law of pleading and practice is the correction of an error or defect in a pleading or judicial proceeding in the progress of an action or other proceeding. The amendment may be "as of course," i.e., without application to the counsel or judge, or "on leave," as the statute or rules of pleading and practice may require. Amendment at common law independently of statute might be made to remedy formal defects by leave of the court at any time before the signing of the judgment in the action. Leave to amend was a discretionary matter, and when granted, it might be on such terms as the court should direct, usually on payment of the

costs of the action up to the time of amendment. By modern statutes amendments are sometimes allowed after judgment in furtherance of justice, and they are at any stage of the case before judgment more liberally allowed than formerly, when the defect is one of substance or affects the merits of the case. See PLEADING; PRACTICE; STATUTE OF JEOFAILS, and the authorities there referred to.

A'MENEM'HAT. The name of four Egyptian kings of the twelfth dynasty.—**AMENEMHAT I.** He reigned for 30 years, beginning about 2130 B.C. How he came to the throne is not known, but on his accession he found Egypt in a state of great disorder. He thoroughly reorganized the government, restored order, and conducted a wise and vigorous administration. He checked the power of the great nobles, and personally superintended a new survey of the whole land. Amenemhat warred in Nubia and on the Asiatic frontier of Egypt, but his chief attention was devoted to internal affairs. He was a great builder, and his monuments are found from Nubia to the Delta. In later times he was esteemed a sage, and, in a work composed apparently under the nineteenth dynasty, he is represented as giving instructions in the art of government, based on his own experience, to his son Usertesen (afterward Usertesen I).—**AMENEMHAT II.** He reigned for 35 years, beginning about 2066 B.C. During the first two years of his reign he was regent with his father, Usertesen I, and, for three years before his death, his son Usertesen II was associated with him in the government. In the twenty-eighth year of his reign he sent an expedition to Punt on the Somali coast.—**AMENEMHAT III.** Son of Usertesen III. He reigned for 44 years, from about 1986 B.C. Monuments of this King are found throughout Egypt, but his greatest work was connected with the Fayum (Coptic, *Phiom*, the lake). Amenemhat I (q.v.) had built a dam, reclaiming a considerable extent of land from the highest part of the bed of Lake Mœris. Amenemhat III greatly extended this system of damming. By means of a large embankment, about 20 miles long, he reclaimed some 40 square miles of fertile land and at the same time converted the lake into a gigantic reservoir, whose waters, replenished annually by the inundation of the Nile, were used for irrigating the adjacent country. The lake continued to serve this purpose down to the fifth century B.C. Later it was gradually dried up, and, under the Ptolemaic dynasty, a Macedonian colony was established on a portion of its former bed. The pyramid of Amenemhat III, at Hawara, near Illahun, is built of Nile brick and formerly had a casing of limestone. When entered by Petrie, in 1889, the King's stone sarcophagus was found in the sepulchral chamber, but the mummy had been removed. Adjoining the pyramid are the ruins of the famous labyrinth, formerly a gigantic peristyle temple, covering an area 1000 feet long by 800 feet broad.—**AMENEMHAT IV.** Son of Amenemhat III, reigned for some nine years, from about 1941 B.C. His reign seems to have been marked by no event of special importance.

A'MEN-HO'TEP. See AMENOPHIS.

AMENITIES OF LITERATURE. A work relating to English literary history, by Isaac Disraeli, completed in 1841.

AM'ENO'PHIS (Egypt. *Amen-hôtep*, Ammon is pleased). The name of four Pharaohs of the

eighteenth dynasty.—**AMENOPHIS I,** the second King of this dynasty, son of Amasis I. He reigned for 10 years, from about 1570 B.C. He carried on some insignificant wars in Nubia, and against the Libyans on the northwest frontier of Egypt. After his early death he was revered as the patron of the Theban necropolis, and, together with his mother, Nofretari, received divine honors. His mummy, found at Dair el-Bahri, is now in the museum of Gizeh.—**AMENOPHIS II.** He reigned for some 25 years, from about 1450 B.C., waged energetic wars in Syria, and maintained the territory inherited from his father, Thothmes III, in Asia and Ethiopia.—**AMENOPHIS III.** Son of Thothmes IV. He reigned for 36 years, from about 1410 B.C. In the early part of his reign he seems to have warred in Asia, but later he did little to maintain his Syrian provinces. The Amarna Letters (q.v.) show that in his reign, and in that of his successor, the Egyptian supremacy in Asia was seriously threatened. Amenophis is noted for his activity as a builder. He erected in Thebes a gigantic temple; but of this nothing remains except the two colossi at the entrance, one of which, in classical times, became famous as "the vocal Memnon." The Amarna Letters record the fact that Amenophis married Gilukhepa, sister of King Dushratta of Mitani in northern Mesopotamia. His principal wife (whom he commemorates on his monuments), Teye, was a foreigner. The magnificent tomb of her parents, Thua and Yua, was discovered in 1905 by Mr. Davis.—**AMENOPHIS IV.** The Napkhururiya (Egyptian Nefer-Khoper-re) of the Amarna Tablets. This monarch is one of the most interesting characters in Egyptian history, because of the great religious reform which he attempted. He endeavored to supersede the old polytheistic religion of Egypt by the exclusive worship of the Sun. But his fanatical efforts in this direction, his persecution of the cult of the Theban god Ammon, and the shifting of his residence to Telet-Amarna led to no permanent results. After his reign of 18 years (beginning about 1375 B.C.) his innovations were abolished, and the old religion was again triumphant. By his wife Nefer-titi he had six daughters.

AMEN'ORRHŒ'A (Gk. *ἀ, a*, priv. + *μήν mēn*, month + *ῥοία, rhoia*, flow, flux). The suspension from any cause other than pregnancy, or the menopause, of the catamenial flow. It is generally an indication of functional disturbance and is to be regarded as a symptom rather than a malady. It is frequently dependent on anæmia, chlorosis, tuberculosis, or obesity, or may be due to defective development of the sexual organs. The treatment adopted should tend to strengthen the general health; the diet should be nourishing and generous, iron and arsenic administered, the bowels carefully regulated, and the patient should take mild exercise in the open air. See EMMENAGOGUE; MENSTRUATION.

A'MENT (Lat. *amentum*, strap or thong), or **CAT'KIN.** A flower cluster in which simple flowers are developed upon an elongated axis and are subtended and more or less concealed by conspicuous bracts. Such clusters are found in the birches, alders, willows, etc., which, in consequence, are often called Amentiferæ. See INFLORESCENCE.

A'MENT, WILLIAM SCOTT (1851–1909). An American missionary in China. He was born at

Owosso, Mich., of Dutch descent, and educated at Oberlin, and at Union (N. Y.) and Andover Theological seminaries. He went to China as a missionary of the American Board and was stationed in Peking, where, in the summer of 1900, he was one of the 800 foreigners and 3000 native Christians who were besieged in the Boxer revolt. When the siege was raised, Dr. Ament, with the missionaries of his station and 500 native Christians, took possession of the deserted premises of a lesser Mongol prince who had become a fugitive. He was a leader in reestablishing the native Christians, and in making necessary readjustments, but subsequently was severely criticised by many of the American newspapers as morally guilty of looting. This charge was disproved. See his life by H. D. Porter (New York, 1911).

AMENTHES, ā-mĕn'thĕz. The Greek form of the Egyptian *Amente*[t], 'the Lower World,' or realm of departed spirits. The word signifies, literally, 'the Western (World),' as the mysterious abode of the dead was supposed to lie beneath the western horizon. The graves of the ancient Egyptians were situated in the desert on the western side of the Nile, and the souls of the dead were believed to pass, with the setting sun, through the gates of Amenthes, where, after many perils, they appeared before Osiris (q.v.) and his 42 assessors to undergo final judgment. The views of the Egyptians in regard to the life of the soul in the nether world were manifold. Plutarch defined Amenthes as meaning 'giving and taking,' and it is sometimes derived from *amen*, 'hidden,' but such etymologies are valueless. See also ANUBIS; SET; AUTHOR.

A'MENTIF'ERÆ. A name of convenience, not of classification; used to include the dicotyledonous plants that bear aments (q.v.) or catkins. The familiar representatives of this assemblage are willows, poplars, walnuts, hickories, birches, alders, beeches, and oaks.

AMERBACH, ä'mĕr-bäg, JOHANNES, also known as EMMERPACH (1444-1513). A German printer, educated in Paris. He established a press at Basel, publishing the works of St. Ambrose and St. Augustine, and began to publish those of St. Jerome, which were finished by his son Boniface. He was one of the first to use Roman instead of Gothic letters.

AMERCE'MENT (Angl. Fr. *amerciment*, from *amercier*, to be at the mercy of). In old English law, a pecuniary penalty imposed for crime or for the violation of the fealty which the freeholder owed his lord. It was imposed as the result of a judicial conviction of the offense charged, but differed from a fine in that it was a commutation of a sentence of forfeiture of goods, while the fine was a commutation of a sentence of imprisonment of the person. The decree of the court was that the offender was at the mercy (*in misericordia, à merci*) of the king, the sheriff, or the lord in whose court the judgment was rendered. The amount of the amercement, originally unlimited, as the term implies, was regulated by a provision of Magna Charta (1215), which decreed that all amercements should be set, or fixed, by good men of the neighborhood, the peers of the offender, and that the amount should vary with the gravity of the offense. Consult Pollock and Maitland, *History of English Law* (2d ed., London and Boston, 1899). See CRIMINAL LAW; FINE: PUNISHMENT.

AME'RIA. The ancient name of Amelia (q.v.), a city in Italy.

AMER'ICA (named after Amerigo Vespucci, an Italian navigator). America, or the New World, is one of the great land divisions of the earth. It has a meridional extent of about 9000 miles, stretching from 72° N. lat. (Boothia Felix) to 56° S. lat. (Cape Horn), without including the Arctic islands. Its extreme northern part extends far within the Arctic Circle, while on the south it stretches to the border of the Antarctic Ocean. Excluding its islands, it lies between the meridians of 34° and 168° west of Greenwich, and has a maximum breadth of about 3300 miles. The entire area is estimated to be 16,000,000 square miles.

General Features. The New World differs from the Old in size, having about half its area. It differs also greatly in outline, in location on the earth's surface, and in the character of its coasts and its relief. The Old World has, very roughly, a triangular form; while the New World consists of two triangles connected with each other. While both grand divisions lie mainly north of the equator, a greater proportion of the Old World is in the northern hemisphere. The coasts of the Old World, taken as a whole, are much more broken than the American coasts. The principal relief feature of the Old World is a great stretch of elevated land crossing most of Europe and Asia in an east and west direction, while the backbone of America traverses its length in a direction nearly north and south, near its western coast.

America is bounded on the north by the Arctic Ocean, on the south by the Antarctic, on the east by the Atlantic, and on the west by the Pacific. While stretching from one polar ocean to the other, it separates the Atlantic and Pacific throughout their whole length. In the extreme northwest it almost touches Asia, from which it is separated by Bering Strait. Very narrow passages separate it from the extensive islands that constitute the Arctic Archipelago of the Western Hemisphere.

Physical Divisions. America is divided into two continents,—North and South America, separated in part by the Caribbean Sea and the Gulf of Mexico, and connected by the narrow Isthmus of Panama, 40 miles in width.

North America has an area of about 8,300,000 square miles; and South America of 7,700,000. The mean altitude above sea level of both continents is not far from 2000 feet.

These two great continents are much alike in some respects, while differing in others. They are both triangular in shape, with the base of the triangle at the north and the opposite apex at the south. Each has its greatest length along meridians, and greatest breadth along parallels of latitude; each has a great mountain system running the whole length of the western side and parallel to it, and a shorter secondary and more disconnected mountain system in the eastern part, also parallel to the coast, the two mountain systems in each case converging toward the lower apex of the continent. In both cases the eastern ranges are the oldest geologically.

While the two American continents thus present certain similarities of configuration, they are very differently placed on the sphere, and thus their climatic differences are marked, and the conditions dependent on climatic influences likewise differ. The broad part of North



America lies mainly within the north temperate zone, and only its apex extends into the tropical zone; thus causing a great portion of the continent to be dominated by comparatively low temperature conditions. In South America, on the contrary, the broad part lies within the tropics, and a comparatively small portion of it extends into the temperate zone.

Coasts. With regard to the nature of their coast-lines, North and South America present an extraordinary contrast. North America, in its extreme irregular coast-line and its great peninsulas, is the counterpart of the Eurasiatic continent in the Old World, while South America, with its almost unbroken coast, is the counterpart of Africa. In North America we have the peninsulas of Alaska, Labrador, Nova Scotia, Florida, Yucatan, and Lower California. South America presents but one great peninsula, that of Patagonia. The Atlantic coast of America is far more irregular and broken than that of the Pacific. On the north of North America, Hudson Bay projects far into the interior of Canada, forming a vast inland sea. Farther south, the Gulf of St. Lawrence and the Bay of Fundy form deep indentations. On the Atlantic coast of the United States are several large bays and harbors, Massachusetts Bay, Long Island Sound, Delaware and Chesapeake bays, and Albemarle and Pamlico sounds being among them. The Gulf of Mexico and the Caribbean Sea have many arms, extending into the land, among them the gulfs of Campeachy, Honduras, and Colon.

The Atlantic coast of South America is simpler, the chief indentations being, on the north the gulfs of Darien and Venezuela, on the northeast the estuary of the Amazon, and on the east the harbors of Bahia and Rio de Janeiro, the estuary of the Rio de la Plata, and the gulfs of Blanca, San Matias, and San Jorge, on the Argentine coast.

The west coasts of both continents are in the main extremely simple. Between lat. 42° S. and 49° N. there are few harbors. In South America, the Gulf of Guayaquil is almost the only indentation of magnitude. South of lat. 42° S., however, the character of the coast changes to a fiord coast, with many deep, narrow passages and hundreds of islands. Where the two continents meet, the bend of the Pacific coast forms the deep bay of Panama. The west coast of North America south of the parallel of 48° N. is broken deeply only by the Gulf of California and San Francisco Bay, but near the northwest corner of the United States a fiord coast commences with Puget Sound and extends thence along British Columbia and Alaska to the Aleutian Islands. The Bering Sea coast of Alaska is low and broken by many indentations, and similar conditions prevail on the Arctic coast.

Topography. The prominent relief feature of both continents consists in a great system of elevation, stretching along or near the western coast, from Cape Horn in South America to the extreme end of the Alaska peninsula in North America. This is known in South America as the Andean Cordillera, and in North America as the Cordillera. It differs greatly in its different parts, in breadth, height, complexity, and character. In North America the Cordillera are succeeded on the east by a broad valley; east of this valley, and separating it from the Atlantic, is the shorter, smaller, and

lower Appalachian system. In South America the succession is somewhat similar. East of the Andes is a broad slope or depression, which in Argentina continues to the Atlantic; but in eastern Brazil and the Guianas the continuity of the eastward slope is broken by numerous short and comparatively low ranges, corresponding roughly with the Appalachians of the northern continent.

North America. In North America the Cordillera develops its greatest breadth and complexity in the main body of the United States. Here it includes a broad plateau 1000 miles in width, with an elevation of from 5000 to 10,000 feet, on which stand a succession of mountain ranges trending nearly north and south, the highest of which rise to altitudes of from 14,000 to 15,000 feet. The highest of these ranges are in Colorado and California. In the former State are the Front Range, with Long's Peak, 14,271 feet; Gray's Peak, 14,341 feet; Pike's Peak, 14,108 feet; the Sangre de Cristo Range, with Blanca Peak, 14,390 feet; the Park Range, with Mount Lincoln, 14,297 feet; the Sawatch Range, with the Mountain of the Holy Cross, 14,170 feet; Elbert Peak, 14,421 feet, and Mount Harvard, 14,375 feet; and the San Juan Mountains, with Uncompahgre Peak, 14,289 feet, and Mount Wilson, 14,250 feet.

The principal range of California is the Sierra Nevada, with Mount Corcoran, 14,093 feet; Fisherman Peak, 14,448 feet; Mount Whitney, 14,502 feet; and Mount Shasta, an extinct volcano, 14,380 feet. The Cascade Range of Oregon, Washington, and British Columbia is a continuation of the Sierra Nevada in direction, though not in structure, as it is in the main the product of volcanic action and contains many extinct volcanoes, the highest of these being Mount Rainier, 14,363 feet. Northward in British Columbia the system is not so high nor so broad, but following the coast around through Alaska, it rises in semi-detached groups and ranges, some of which are of great height, culminating in Mount McKinley, north of the head of Cook Inlet, 20,500 feet in height, the highest summit in North America. Another high peak, on the boundary between Alaska and Canada, is Mount St. Elias, 18,024 feet above the sea. This was long supposed to be the highest point in North America.

The area of Mexico, with the exception of the State of Yucatan, lies almost entirely within the Cordilleran mountain system. The plateau extends southward into it from the United States, with an elevation ranging from 4000 to 7000 feet. Upon this undulating table-land, which is known as the plateau of Anahuac, are many mountain ranges and many active or dormant volcanoes, the latter being the highest peaks of the country. Among them are Popocatepetl, 17,520 feet; Orizaba, 18,250 feet; Iztaccihuatl, 16,960 feet; Nevada de Toluca, 14,950 feet; and Malinche, 13,460 feet. In the countries of Central America the Cordillera is represented by detached ranges of hills, with numerous volcanic peaks, some of which are active, others extinct.

The depression lying east of the Cordillera stretches in the north to the Atlantic or to Hudson Bay, and in southern Canada and the United States to the Appalachian or Eastern Mountains, with a breadth of 25° of longitude. Over this great area the surface presents no serious variations of level. The only elevations of importance are the Ozark Hills in Arkansas, south-

ern Missouri, and Oklahoma, with a maximum altitude little over 3000 feet.

The Appalachian Mountains extend from Newfoundland and the Gaspé Peninsula in south-eastern Canada, southwestward through the eastern United States to central Alabama and Georgia, in a fairly continuous system. They form a narrow plateau, 100 to 300 miles in width and 1500 to 3000 feet in height, which is bordered on the east by the Blue Ridge and on the west by the Alleghany Mountains. In the northern section the line of elevations includes the Green and White Mountains of Vermont and New Hampshire, which differ more or less in their geological structure from the central and southern portions of the system. The highest summits are Mount Washington in New Hampshire, 6279 feet, and Mount Mitchell in North Carolina, 6711 feet. East of this mountain system the land slopes gently to the Atlantic coast, and is known as the Piedmont Plateau and the Atlantic Plain. See ROCKY MOUNTAINS; APPALACHIANS; ETC.

South America. The Cordillera of the Andes follows the western coast of South America in a continuous mountain system from Cape Horn to the Isthmus of Panama, leaving a narrow strip of lowland between its base and the coast nowhere much more than a hundred miles in breadth. In the south the system is narrow and simple, consisting in great part of a single range, which has no great height. Northward it increases in altitude and becomes more complex, reaching a culminating point in the great peak of Aconcagua, in lat. 32° S., which reaches the height of 23,080 feet, the loftiest summit in South America. Still farther north the peaks are not so high, but the system broadens and becomes more complicated by the appearance of ranges in Argentina, east of the Andes proper. In lat. 18° S. the system curves to the northwest, following the coast; here it has a breadth of fully 300 miles, with two, and, in places, three main ranges, and incloses an elevated plateau, on which is situated Lake Titicaca, 12,645 feet high. Near this lake, in the Cordillera Real, are many high peaks, among them Ancocuma, 21,490 feet; Cacaca, 20,250 feet; and Illimani, 21,192 feet.

Still following the coast, the system turns north again at the Gulf of Guayaquil, maintaining the form of a broad, elevated plateau, bordered by lofty ranges, with many volcanic peaks. In the neighborhood of the equator, in Ecuador, are many notable peaks, among them Tunguragua, 16,690 feet; Cotopaxi, 19,613 feet; Chimborazo, 20,498 feet; Antisana, 19,335 feet; Cayambe, 19,186 feet; and Pichincha, 15,918 feet. From this knot of lofty volcanoes the system falls off in altitude northward toward the Isthmus of Panama and the shores of the Caribbean Sea, splitting into three ranges, which trend away from one another to the north and northeast.

East of the Andes the level of the land descends rapidly to the llanos of the Orinoco, the valley of the Amazon, and the pampas of Argentina. This great area, comprising by far the greater part of South America, is but slightly diversified by hills, forming mainly an immense plain. In eastern Brazil is a mountain system standing on a broad plateau, and composed of many ranges, trending in general parallel to the coast and having collectively a great breadth. The highest point in this system is

Itatiaia, with an altitude of 10,340 feet. A similar but smaller plateau occupies much of the area of the Guianas. See ANDES, etc.

The islands pertaining to this grand division belong mainly to North America. In the Arctic Ocean these land bodies are numerous and large, Greenland, almost continental in area, being the largest of them. West of Greenland, across Smith Sound, is the great extent of Ellsmere Island, with Axel Heiberg, and other islands west of it, and south of this are North Devon and Baffin islands, with many other large islands to the west, including Bathurst, Melville, Prince of Wales, North Somerset, Banks and Victoria islands, the whole forming an extensive archipelago in the Arctic Sea. In Bering Sea, on the northwest of the continent, are several smaller islands, while the chain of the Aleutian Islands, stretching in a great curve, convex southward, from the point of the Alaskan Peninsula, partly separates Bering Sea from the Pacific. On the east side of the continent, the great island of Newfoundland partially closes the mouth of the Gulf of St. Lawrence.

Mainly within the tropics, and lying between the northern coast of South America and the southeast coast of the United States, are the West Indies, with Cuba, Haiti, Jamaica, and Porto Rico, known collectively as the Greater Antilles, and many smaller islands grouped about and stretching away from them. They are the unsubmerged portions of a mountain system. On the north side are the Bahamas, consisting of a large number of small coral islands, and on the southeast, stretching in a broad curve, convex to the east, to the south American coast, are the Lesser Antilles,—all small, and many of them of volcanic origin. The best known among them are Guadeloupe, Martinique, and Trinidad. South America has few islands, the Falkland Isles, east of the Strait of Magellan, being the largest, if we except Tierra del Fuego, at the south end of the continent. Off the west coast, and under the equator, are the Galapagos Islands, once prominent as a source of guano.

Hydrography. *North America.*—While most of North America is drained into the Atlantic, great areas are drained into the Pacific and Arctic oceans. The Rocky Mountains, i.e., the easternmost ranges of the Cordillera, carry the continental divide, and most of the ranges and valleys of this system are drained westward to the Pacific by the Colorado River of the West, through its marvelous canyons to the head of the Gulf of California, by the Sacramento and San Joaquin, to San Francisco Bay, and by the Columbia, the Fraser, Copper, and other rivers. The northern and northeastern slopes of the system, as well as most of Alaska and much of the Yukon province of Canada, are drained by the great river Yukon to Bering Sea. The northern part of the great central depression of the continent sends its waters to the Arctic Ocean by way of the Mackenzie and Coppermine rivers. Farther south the land is drained to Hudson Bay by the Nelson and other rivers, and to the Atlantic directly by the chain of the great lakes, Superior, Michigan, Huron, Erie, and Ontario, and the river St. Lawrence. The waters of the southern part of this depression are collected by one of the greatest rivers of the earth, the Mississippi, with its branches, the Ohio, Missouri, Arkansas and Red rivers, and are carried to the Gulf of Mexico. The coast-land



of the Gulf of Mexico itself is drained by a number of rivers on either side of the Mississippi. The Atlantic slope of the Appalachian mountain system is drained to the Atlantic by many comparatively small rivers.

Besides the great lakes of the St. Lawrence system, North America contains many large bodies of water. In Canada are Great Bear and Great Slave and Athabasca lakes in the Mackenzie River system; lakes Reindeer, Winnipeg, Manitoba, and Lake of the Woods, which are drained to Hudson Bay, and Lake Nepigon, tributary to the St. Lawrence system. In the northern United States are thousands of small lakes, which, in common with those of Canada, were formed by the Laurentian glacier. In the Cordilleran region are many lakes, some of glacial origin, like Pend Oreille and Flathead, others of volcanic origin, like Yellowstone Lake, while many occupy desert valleys and have no outlet, like Great Salt, Carson, and Walker lakes. See YUKON RIVER; MISSISSIPPI, ETC.

South America.—South America is for the most part drained into the Atlantic Ocean, the Andes forming a great and continuous watershed; and while three great river systems carry most of the waters to the sea, yet a number of secondary but by no means small rivers aid them in this work. In the extreme northwest of South America, the Magdalena drains the region in which the Andes separate into diverging ranges before their subsidence. The area of its basin is not great, but the enormous rainfall sends great volumes of water through this river channel into the Caribbean Sea. The entire length of the Magdalena, independent of its windings, is not over 700 miles. The great valley at the extreme north of South America, lying between the Andes on the west and the plateau of Guiana on the east, is drained by the Orinoco, which, although not more than 1200 or 1400 miles long, not counting the windings, carries an immense volume of water into the Atlantic, because it, too, lies almost wholly within the belt of excessive rains. Between the Orinoco and the Amazon there are a number of short rivers draining the plateau of Guiana, and heading chiefly in the watershed between this section and the valley of the Amazon on the south. Next in order, proceeding southward on the Atlantic coast, is the mighty Amazon itself, whose system drains the great valley included between the plateau of Brazil on the southeast, the plateau of Guiana on the north, the Andes on the west, and the highlands of the Cordillera Geral and Matto Grosso on the south, thus embracing about one-third of South America. The Amazon pours a vastly greater quantity of water into the ocean than any other river on the globe. The plateau of Brazil is drained chiefly by the Tocantins, which flows to the north and empties into the Pará estuary; a number of smaller streams which flow northeast and enter the Atlantic between the mouth of the Pará and Cape St. Roque; the São Francisco, which has a generally northeastern direction, and a few smaller streams which drain the short eastern slopes along the whole extent of coast between the mouth of the São Francisco, lat. 10° S., and the estuary of the Plata, lat. 35° S. The Plata, which receives the waters of the Paraná, Paraguay, and Uruguay, drains the whole of the south central part of South America, from the Amazon watershed in lat. 15° S. to lat. 35° S., and embraced between

the coast sierra on the east and the Andes on the west. This great river system has been compared with the Mississippi River system, with which it has certain features in common. South of the Plata are a number of rivers, including the Colorado, Negro, and Chubut. On the Pacific coast the drainage is effected by short, torrential streams scarcely worthy the name of river. See AMAZON; ORINOCO, ETC.

Geology. The geological history of North America, considered in a broad way, is not complex. The oldest part of the continent, the first to be elevated above the sea, is the northwestern section, including the Adirondacks of New York and the Laurentian Highlands of Canada, and a region about the Great Lakes, together with a southward projection just east of the Blue Ridge in the Southern States. This is the Archæan area. From this, as a nucleus, the continent grew westward, as is indicated by the surface formations, which become successively more recent. The eastern portions of the Appalachians are in great part composed of Silurian beds. The plateau forming the western part of the system is Carboniferous, which formation also underlies much of the Mississippi valley. The great plains which form the eastward slope of the Cordilleran plateau are floored, in westward succession, by Triassic, Cretaceous, and Tertiary beds.

The mountains of the Cordilleran system are mainly of recent formation and show strata of all ages, as they have been much disturbed by uplift, and the beds exposed by subsequent erosion. Upon the mountains granitic rocks largely predominate, as the stratified beds which formerly covered them have been eroded away, while in very many cases these stratified beds still remain on the flanks of the ranges, as hog-back ridges. The valleys are often partially filled with detritus from the mountains. In this region many great areas have been covered by outflows of lava, some of them in very recent times. The regions bordering the coasts of the Atlantic and the Gulf of Mexico are floored with Cretaceous and Tertiary deposits, indicating their comparatively recent uplift. At present there are no active volcanoes in the United States proper or in Canada. The third greatest volcanic belt in the world is in Alaska, extending from Mount Wrangell for 1600 miles westerly along the Alaska peninsula and the Aleutian chain. Some of the volcanoes of this region are majestic in their proportions, like Iliamna, Redoubt, Shishaldin, and Wrangell, which range in height from 8952 for Shishaldin to 17,500 for Wrangell. Shishaldin is constantly active. There have been numerous violent eruptions in this field, the latest, highly destructive, the eruption of Katmai on June 6, 1912, a peak 7500 feet high, on the peninsula opposite Kodiak Island. Day was made night, and the town of Kodiak, 100 miles distant, was covered with ashes like a deep snow. Bogoslof peak, which rises out of Bering Sea northwest of Unalaska, forms and reforms its surface frequently, aided by the disintegrating action of the sea. In Mexico, Central America, and the West Indies there are many active volcanoes. See *Geology* under UNITED STATES; CANADA, ETC.

South America.—The eastern highlands are of Archæan and Palæozoic formations, with a superimposed layer of sandstone. No subsequent submergence has occurred, and no folding has taken place since Palæozoic times, so that

no recent marine deposits have been made, and the deep valleys are due to erosion rather than to irregular faulting, the rock layers lying horizontally. These eastern highlands are but the remains of a great mountain system which has been worn away to the existing condition in the filling up of the plains below, to which they have contributed their material. The western highlands (see ANDES), while of more recent origin than the eastern, are made up of ranges differing in geologic age. Most of the great peaks of the Andes are of volcanic origin, and many of them are still active, or have been eruptive in recent and historic times. The lowlands east of the Andes are, so far as known, floored with Tertiary deposits, with broad bands of alluvium bordering the larger streams. See *Geology* under BRAZIL; ARGENTINA, ETC.

Glaciation. In recent geologic times nearly all of Canada and much of the United States were covered by a great sheet of ice, the Laurentian glacier. In the United States it covered New England and New York, extended southward to the Ohio River and westward to the Missouri. Throughout this area the surface has been modified by erosion and deposition by ice. Stream courses have been changed, countless lake basins have been formed, and the surface covered with drumlins, kames, and other morainal deposits. In the northern part of the Cordillera evidences of former glaciation are everywhere abundant, and in the higher ranges many glaciers still exist. Indeed, in the mountains on the Alaska coast, where the precipitation is profuse, there are glaciers of great magnitude, many of which reach the sea. The Muir Glacier covers over 350 square miles, and there are others of equal size. In the fiords of Prince William Sound huge glaciers reaching tide water are common. Even these great glaciers, however, are but the much reduced relics of far larger ones, which covered the coast and eroded the fiords intersecting it.

In South America the glacial history, so far as known, is confined to the Andes. Most of the higher peaks, even those under the equator, have glaciers upon their upper slopes, while in the southern portion of the system glaciers are extremely abundant, and the configuration of the land shows that in past time they covered it, lying in every gorge and fiord, which are evidently products of ice erosion.

Climate. Stretching from the south temperate zone through the tropics to the north polar zone, America has many climates, dependent upon latitude, prevailing winds, and the distribution of the relief features. The main body of North America is principally within the region of the anti-trades or prevailing westerlies. These winds give to the western coast of the United States and Canada and to southeastern Alaska an insular climate with great uniformity of temperature and a heavy rainfall. Their influence extends inland but a short distance, owing to the mountain ranges which border this coast, and the rest of the United States and Canada have a continental climate with much greater extremes of temperature; the Cordilleran region, which is dependent upon the Pacific as its source of precipitation, has an arid climate; but in the east, where the Gulf of Mexico and the Atlantic serve as sources of supply, the rainfall is ample.

Central America is within the region of the trade winds and has measurably an insular cli-

mate, owing to the narrowness of the land. That portion of South America which lies in the tropics, over which the trade winds blow continuously from the east, has a warm, moist climate and a heavy rainfall. This region is limited on the west by the Andes, over whose wall none of the moisture from the Atlantic can pass. Hence most of the Pacific coast of South America within the tropics is a desert. In Chile and Argentina the conditions prevailing in North America are duplicated. Here in the south temperate zone the prevailing westerly winds bring to the western coast the mild, saturated atmosphere of the Pacific. The temperature is uniform throughout the year and the rainfall heavy; while east of the Andes the westerly winds, deprived of their moisture in crossing the mountains, blow dry over the land, and the semi-desert pampas are the result.

North America.—The mean annual temperature ranges from 80° F. in Central America down to 5° on the Arctic coast, and except on the Pacific coast the temperature decreases quite regularly with the latitude. On the Pacific coast the reduction in temperature with increase in latitude is much less rapid. At San Diego, on the southern boundary of the United States, the mean annual temperature is about 70°, while the Alaska coast, even as far north as Prince William Sound, has a temperature only 30° lower and 20° higher than in the same latitude on the Labrador coast. This measures the effect of the ocean in ameliorating the mean annual temperature.

In midwinter (January) the temperature ranges from 80° in the south to -25° on the Arctic coast. Here again the reduction with increasing latitude is much less on the Pacific coast than in the interior or on the Atlantic coast. The coast of southern Alaska is 30° warmer than that of Labrador in approximately the same latitude. The midsummer (July) temperature is highest on the arid plateau of northern Mexico and in southern Arizona, where it reaches 95°. Thence it diminishes in all directions, sharply to the west as the Pacific coast is neared, and much more gradually northward and eastward. The range of summer temperature between San Diego and the Aleutian Islands is but 20°, from 70° to 50°, while in the eastern part of the continent its range is from 80° to 40°, and in the Cordilleran region from 95° to 40°. In this latter region extreme heat as well as extreme cold is frequently encountered; in southern Arizona temperatures of 120° have been recorded, and 100° as far north as lat. 60°. On the Pacific coast the range of temperature between midsummer and midwinter (July and January) seldom exceeds 20°, while upon the Atlantic coast the corresponding range is nearly twice as great, and in the Cordilleran region it is in many places three times as great.

The distribution of rainfall over North America depends upon the configuration and relief of the land and on the direction of the winds. In the region of the trade winds the rainfall is very heavy, 200 inches at Panama, and diminishing northward. In the region of the anti-trades, the Pacific coast receives nearly all the moisture brought by these winds from the Pacific, and here the amount and distribution of the rainfall are radically affected by the relative temperatures of land and sea. Where and when the land is colder than the sea, moisture is condensed from the air currents and falls in

rain; the rainfall is therefore heavy on the northern part of this coast and light on the southern part, and is heavy in winter and light or entirely absent in summer.⁷

At San Diego the rainfall, even in winter, is very light, while at Puget Sound it has increased to from 75 to 100 inches, and has an average along the Alaska Pacific coast of about 90 inches annually, most of which falls in winter. Air currents from the Pacific, deprived of most of their moisture in passing over the mountain ranges near the Pacific coast, flow over the Cordilleran region during most of the year as dry winds. In the summer, however, they retain a little moisture, which they give up to the high ranges of the interior. Hence this region, which is upon the whole desert, or semi-desert, receives most of its scanty supply of rain, 20 inches or less, in the summer time.

Moving eastward, this general air movement from west to east, which commonly takes the form of great cyclones or anti-cyclones, draws air currents from all directions. These, coming off the Gulf of Mexico, are saturated with moisture and, cooling as they go northward, give rain to the land. Thus the great depression of the continent is watered in the main from the Gulf of Mexico, the rainfall ranging from 60 inches on the coast to 30 inches in the region of the Great Lakes and Hudson Bay. These cyclonic disturbances, as they approach the Atlantic, draw saturated air currents in from that ocean, and from that source of moisture the Atlantic coast is watered, the amount of rainfall ranging from 50 to 40 inches.

South America.—The southern continent has no such range of temperature as North America, since it lies on both sides of the equator. The annual temperature ranges from 80° to 40°, the highest temperature being in the northern part. The midwinter (July) temperature ranges from about 80° in the north to 35° in the south, and the midsummer temperature from 85° to 50°, the highest being in the interior, in northern Argentina. On the southern part of the west coast of South America, where the prevailing winds are from the west, the temperature is moderated by them as on the western coast of North America, making the winter temperature higher and the summer temperature lower. The greatest range between summer and winter is found in northern Argentina, a region corresponding in situation to the Cordilleran region in North America. Here the range between the hottest and coldest months is from 25° to 30°.

The great Amazon basin, lying within the tropics, is abundantly watered by the trade winds which come to it saturated from the Atlantic. The rainfall over this great area is estimated at from 50 to 75 inches and in some parts is 150 to 200 inches. This heavy rainfall extends to the foot of the Andes and even up its abrupt eastern slopes. The air currents, thus deprived of their moisture, descend the western slope as dry winds, and the narrow western base of the range receives little moisture. Farther south in southern Chile and Argentina, the conditions are reversed. The westerly winds bring rain to the narrow strip of land on the west coast, which receives as much as 80 inches in certain localities, and the pampas on the east receive very little, on account of the intercepting mountains.

Flora. North America.—The flora of North

America is varied, ranging from those plants peculiar to Arctic regions to those of the tropics. In the extreme northern part of Canada and Alaska, where the ground is constantly frozen, thawing only on the surface in the summer and forming the well-known tundra, the prevailing plant life consists of grasses, moss, with a few dwarf Arctic willows. But in the short, hot summers of this region even the tundra is gay with bright-colored blossoms. Near the Arctic Circle forests of spruce, with some birch and alders, appear, at first in scattering clumps, and then more continuously, especially along the river bottoms. Thence southward as far as the North Saskatchewan River, in Canada, the land is forested with coniferous trees, spruce, pine, fir and hemlock. This timbered area extends southward along the Pacific coast nearly to San Francisco Bay. In Washington, Oregon, and California exist probably the heaviest forests in the world, consisting entirely of coniferæ, great firs, sugar pines, redwoods, and the giant sequoia, the largest and the oldest living thing.

Eastern Canada and the United States are forested, the western limit including most of Minnesota, Wisconsin, and Indiana, southern Missouri, the eastern part of Indian Territory, and northeastern Texas. In the central United States the prevalent species change to hard woods, while in the southern States yellow pine becomes the dominant species. West of this forested region in the United States and Canada is the prairie region, once grassed and with groves of timber, now highly cultivated, which passes by insensible degrees into the treeless plains which form the eastern slope of the Cordilleran plateau.

In the Cordilleran region forests are, as a rule, found only on the mountains and consist mainly of coniferæ. The valley vegetation depends upon the degree of aridity; here may be found grass, artemisia, cacti, yucca, and other thorny desert shrubs, which in some localities grow so densely as to form what is called chaparral. Throughout a certain belt from northern Texas across New Mexico, Arizona, southern Colorado, and southern Utah, on mesas and the lower hills and mountains occur the piñon (*pinus edulis*) and the juniper. The northern plateau region of Mexico is without forests, except upon the higher ranges, while the southern and lower part of the country, with Central America, has a tropical profusion of fruit and vegetation. See *Flora*, under ROCKY MOUNTAINS; CANADA; UNITED STATES; MEXICO; NICARAGUA, ETC.

South America.—The flora of South America ranges from that of the tropical to that of the temperate zone and is controlled not only by latitude, but by altitude and rainfall. At the extreme north in Colombia, on the waters of the Magdalena, the hot climate and excessive rainfall produce a luxuriant vegetation which changes from its tropical character only with great change of altitude above the sea, palms, bamboos, and tree ferns forming much of the lower forests, and coniferæ higher on the mountains. To the east of this region are the llanos of the Orinoco, with their tall grasses and isolated trees. To the south of these, east of the Andes, are the great selvas of the Amazon, with their rich forests and mixed flora. Directly south of these occur the great forests of the Matto Grosso, to the east of which lie the Ca-

tinga woodlands and the Brazilian campos, with their thickets interspersed with open glades. To the west of the Matto Grosso lie the low mountains of southwestern Brazil and Bolivia. To the south of the Matto Grosso lies the Gran Chaco, with its wax palms and other rich forest growth. Still farther south begin the plains or pampas of the Plata, which, at first consisting of rich grasses, soon degenerate into the dry plains of southern Argentina, with their stunted and poor plant growth. The flora of the western strip of South America, which includes the Andean regions, is in general tropical or sub-tropical at low levels, and changes in altitudinal zones with increase of height above the sea level, but is much modified by the distribution of rainfall throughout the length of the continent, which permits of an abundant vegetable growth in the northern and southern portions, but greatly limits it in the intervening region of little rainfall. The potato is indigenous to South America. See *Flora* under ANDES; COLOMBIA; ECUADOR; PERU; BOLIVIA; CHILE; AMAZON; BRAZIL; ARGENTINA.

Fauna. In considering this subject, it must be recognized, first, that we here have to deal with two continental faunæ, for the animal life of North America is almost completely different from that of South and Central America. This unlikeness seems related in large degree to history and derivation. The fauna of North America is very similar to that of the northern zones of the Old World, in large part identical with it. Among mammals substantially similar to those of Europe or northern Asia are all the bears, wolves, the lynx, most fur-bearers (*Mustelidæ*), the bison, reindeer, moose ("elk" of Europe), bighorn, white goat, beaver, and the majority of the rodents, and small insectivores, bats, etc., where the differences are rarely more than generic. The peculiar North American mammals of note are the puma, the skunk, the pronghorn, the musk-ox, and certain rodents, as the pouched-rats and sewellel. The absentees are equally interesting. Although they arose in Tertiary North America, no horses, camels, or rhinoceroses are in its recent fauna; nor any true antelopes or swine (except in the extreme southwest); of marsupials a single form, the opossum, is present. The birds present a similar parallelism with northern Europe and Asia, many species, and nearly all the families, being common to both continents. The same is true of reptiles and amphibians, which are marked in North America by the preponderance of certain subordinate forms, such as the rattlesnakes, rather than by anything very different from those of the Old World. Fishes present somewhat greater distinctions, yet the bulk of fresh-water fish are similar to, and some are identical with, those of the colder parts of Europe. Insects and fresh-water mollusks seem generally related to those of Europe and Asia; but the United States is richer than any other part of the world in fluviatile mollusks, especially river mussels (*Unionidæ*). On the whole, the Nearctic fauna is closely allied to the Palæartic, and by some students they are united in a single grand division, termed "Holarctic," or "Triarctic."

South America, considered with reference to its fauna, includes Central America, the lowlands of Mexico, and the West Indies, and forms one of the grand zoögeographical divisions, named "Neotropical" by Selater. It is characterized by

richness and isolation, leading to the belief that its union with North America has been accomplished at a comparatively recent date and that the origin of its animal population is exceedingly remote and was followed by long isolation. It has eight families of mammals absolutely confined to it, including two families of monkeys, markedly different from those of the Old World (but no lemurs), the blood-sucking bats, and the greater part of the order of Edentates, and many peculiar rodents. The continent has no *Mustelidæ* or *Viverridæ*; only one kind of bear; almost no insectivora; no horses or related animals, except one species of tapir; no ruminants, except the cameloid llamas (not known elsewhere), and only a few small ungulates of any sort. Birds display still greater isolation and singularity when compared with the avifauna of the Old World or of North America. Wallace gives 23 families and 600 genera as exclusively Neotropical, while that continent or its northerly extensions possess the greater part of many other important families, such as the humming-birds (some 500 species), tanagers, and macaws, to which must be added a long list of peculiar sea-fowl. Among reptiles there are less peculiar forms, the boas and scytales being most conspicuous among snakes; but there are several local families of lizards and many genera, the iguanids being widely developed, while the *Varanidæ*, *Lacertidæ*, and *Agamidæ*, so characteristic of the Old World, are entirely absent from America. The Amphibia present a similar case. Fishes of fresh waters are enormously abundant, and their resemblance, as a whole, is to the African piscifauna, while many are survivors of very ancient types, such as lepidosiren. Similar facts might be adduced to show the regional exclusiveness of the insects and other invertebrates. On the whole, South America is characterized by the possession of a very uniformly distributed fauna, far more local and distinct than that of any other continent, unless it be Australia, probably more than four-fifths of its species being restricted to its zoögeographical boundaries. See DISTRIBUTION OF ANIMALS.

HISTORY

Discovery. Christopher Columbus, in 1492, added a new world to European commerce and civilization; but there can be little doubt that the Western Hemisphere to which Columbus opened the way had previously been visited by voyagers from the older world. There is nothing inherently impossible in the stories that Japanese or Chinese vessels, blown by storms or carried by the Pacific currents, reached the western coast of North America. The most circumstantial of these tales relates that some Chinese Buddhist priests in the fifth century A.D. reached a land of Fu-sang, and successfully returned with the account of their adventures in what some critics have thought was the country now known as Mexico, but which is now generally believed to have been Japan. From Europe the earliest visitors to America came by way of Iceland, and the story of their experiences, though it does not satisfy all the demands of modern historical criticism, may safely be deemed true in its principal details. In 876 Gunnbjörn, a sea rover, while on his way from Norway to the new Norse settlement in Iceland, was blown westward until he sighted an unknown land. A

century later, about 985, a restless young Norwegian named Eric the Red succeeded in verifying the stories which had been handed down from Gunnbjörn's time and in establishing a settlement on the shores of the land to which, with the idea of attracting colonists, he gave the name of Greenland. Two years or so after this, Bjarni Herjulfson, while in command of a ship in which he had set out to visit the Red Eric's settlement, encountered storms that drove him, as he reported, southward until he came in sight of land.

In the year 1000 Leif, Eric's son, started to explore Bjarni's land. He came first to a barren shore backed by ice-covered mountains, a description which suggests Labrador. Sailing south, he met with more pleasant regions, to which he gave the names of Markland and Vinland. Many attempts have been made to identify these localities, and Newfoundland and Nova Scotia perhaps best answer the essential conditions. At Vinland a flourishing settlement was established and maintained for several years, and there Gudrid, the wife of Thorfinn Karlsefni, gave birth, in 1007, to a son, Snorri, from whom the sculptor Thorwaldsen claimed descent. Many localities—Newport and Dighton, on Narragansett Bay; Cambridge and Waltham, on the Charles; Salem, indeed, well-nigh every town situated beside a pleasant river northward from Long Island—have laid claim to this Norse settlement, regarding the actual situation of which, however, nothing certain is known. During the succeeding 500 years many voyagers may have crossed the Atlantic, but none of them left any proof of their work. Madoc, son of Owen Gwynedd, a Prince of Wales, is said by Humfrey Lloyd, in a book printed in 1559, to have sailed westward and to have established a transatlantic Welsh colony in 1170. The Venetian brothers Zeno, between 1380 and 1390, probably made a voyage from the Shetland Islands to Iceland and Greenland, and in their letters home to their Italian brethren they seem to have given a picturesque account of what they had learned about the country lying still farther to the southwest. French, Breton, and Basque fishing vessels very likely visited the cod banks in the western Atlantic during the fifteenth century; but if they did, they were careful not to let the information of their valuable discovery reach their rivals.

Consecutive discovery and exploration began with the voyage of Christopher Columbus in 1492. (For a full account of his expeditions, see COLUMBUS, CHRISTOPHER.) In 1493 and 1494 Columbus established the main features of the islands in the West Indies. In his third voyage, 1498, he touched at Trinidad and followed the mainland for some distance; and in 1502-04 he coasted from Yucatan to Venezuela. Meanwhile, in 1497, John Cabot sailed from England and reached the neighborhood of the Gulf of St. Lawrence; but many years passed before the identity of the land, which served as headquarters for the hosts of fishing boats frequenting the banks, with that of the New World of the Spaniards was definitely determined. It appears probable that almost simultaneously with Cabot's landing on the American continent Pinzon (accompanied by Vespucci) discovered Central America. A succession of voyages now rapidly extended geographical knowledge of the coast line of the Mexican Gulf and northeastern South America. In 1499

Ojeda and Vespucci coasted the northern shores of the southern continent, naming Venezuela, 'the little Venice,' and uniting this coast with the territory visited by Columbus. Pinzon, early in 1500, reached Brazil, entered the mouth of the Amazon, and crossed the equator, reaching 8° 20' S. on the Brazil coast. Cabral, in 1500, too, was blown to the same coast while trying to follow the route of Vasco da Gama to the East Indies and thus established the Portuguese claim to a part of America. Vespucci, transferring his services to Portugal, in 1501 followed the coast from Cabral's Land nearly to the mouth of the Plata. These were the official recorded voyages; but the extent and importance of the information secured by the surreptitious voyagers who were striving to gain a part of whatever the new-found lands had to offer is best shown by the fact that though Cuba was not officially circumnavigated until 1508, by Ocampo, nevertheless, it is represented as an island on La Cosa's map of 1500 and on the Cantino Portuguese map of 1502. As soon as it was realized that a vast land mass still barred the way to India and Japan, the problem of foremost importance became that of finding a water route through or around the western continent. The way was found in 1520 by Fernão Magalhães, commonly known as Magellan. Magalhães sailed so directly for the strait which now bears his name that it has been surmised that he already knew of its probable existence from the captains of merchant vessels who had explored the coast to the extreme south in their search for trading chances, and, indeed, it is depicted on a globe made before the voyage of Magalhães. (This globe was made by Johann Schöner, 1515. A copy of it is in the city museum of Frankfort, Germany. Magalhães passed through the strait in Oct.-Nov., 1520.) From the western end of the strait Magalhães laid his course to the East Indies. There, on one of the Philippine Islands, he was killed in April, 1521; but Juan Sebastian del Cano, in command of the *Victoria*, prosecuted the voyage successfully, and reached Seville in September, 1522, by way of the Cape of Good Hope, having circumnavigated the globe for the first time.

The exploration of the interior demanded attention as soon as the main features of the coast had been determined. In 1513 Vasco Nuñez de Balboa ascended one of the peaks in the range which forms the isthmus of Panama, and looked down upon a south sea, to which Magalhães, a few years later, gave the name of Pacific, because of his calm and pleasant passage. Cortes, in 1519, set out from Cuba to investigate the persistent gold rumors from the West, and landed at a port to which he piously gave the name of Vera Cruz. Two years later he had mastered the geography, as well as the people, of central Mexico, and within the ensuing ten years his captains traversed a large part of the Central American region, reaching the Pacific by several routes. In 1527 Cortes built a fleet on the western coast, which he dispatched to the Moluccas under Alvaro de Saavedra, for the purpose of coöperating with an expedition commanded by Sebastian Cabot, who had, however, turned aside from his original purpose of sailing to the East Indies by way of the Strait of Magellan, and was spending three years in ascending nearly to the head waters of the Plata. In 1536 Cortes found Lower California, which

was supposed to be an island. In 1539 Francisco de Ulloa determined it to be a peninsula. This, however, was forgotten, and in 1540 Alarcón proved its continuity with the mainland by his trip up the Colorado River of the West. Similarly, in 1512, Ponce de Leon discovered the "island" of Florida, which Pineda, in 1519, definitely connected with the continent by a voyage along the coast from Florida to Vera Cruz. Ponce de Leon was followed by Narvaez, Cabeza de Vaca (the latter making the first journey of a European across the continent to the west coast of northern Mexico, in 1536), and Fernando de Soto, whose explorations, combined with that of Vasquez Coronado from Mexico to the Kansas-Nebraska prairies, had, by 1545, made known the principal features of central North America south of the Missouri and Ohio rivers.

Francisco Pizarro was the successful discoverer of the truth in the reports of a rich land southward from Panama, of which the settlers had heard from the time of their first visit to the isthmus. Between 1531 and 1534 Pizarro brought the Inca Empire of Peru within the limits of the known world, while his associate, Diego de Almagro, pushed on farther south into the plateau of northern Chile. Gonzalez Pizarro, in 1540-41, crossed the Andes and reached the head waters of the Amazon, which one of his companions, Francisco de Orellana, followed down to its mouth, reaching the sea in August, 1541. The reports of a large river in the northeastern part of the southern continent caused much confusion in the handiwork of European map-makers, and it was a long while before they succeeded in evolving two distinct river systems. It is often quite impossible to determine from the narratives of early explorers in the interior whether they are describing the Orinoco or the Amazon. The latter was known at first by several names, among them *Marañon* and *Orellana*; but the name given for the tribe whose female warriors, with their men, fought *Orellana* and thereby suggested the original Amazon myth of the Old World, eventually became the accepted designation. The other great river system, that of the *Plata*, was first visited in 1515 by De Solis, whose name clung to it for several years, until after the explorations of Sebastian Cabot and Diego Garcia in 1527-30. The only remaining section of South America, from the Strait of Magellan northward to Chile, which had been explored to 40° south by Valdivia in 1540, is not known to have been visited until the latter part of the century, when Drake and his fellow freebooters undertook to tap the sources of Spanish wealth. Drake started off on a mission of vengeance for the injuries he had brought upon himself in the West Indies in the winter of 1577-78. Sailing through the Strait of Magellan, he followed up the west coast, plundering as he went, until he had filled his vessels with Spanish treasure. Learning that his enemies were watching to attack him when he should return through the strait, Drake decided to seek some other way home to England. He tried first for a northwest passage; but the season was not propitious, and after visiting the California coast and annexing it to the British crown under the name of New Albion, he turned westward and completed the first English circumnavigation in 1580.

John Cabot showed the way to the Newfoundland Banks, and it is probable that English,

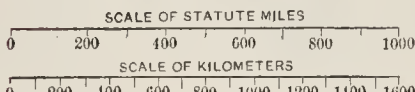
Breton, and Basque fishermen visited the neighboring coasts regularly from the very beginning of the sixteenth century. They added little, however, to the general geographical knowledge of the country. Gaspar de Cortereal visited the St. Lawrence region or the Labrador coast in 1500-01, and Jean Denys of Honfleur was on the Newfoundland coast in 1506. By chance a record of these voyages has been preserved. Many similar voyages must have been undertaken, but all traces of them are lost. In 1524 Giovanni de Verrazano, sailing with a commission from the French King, followed the North American coast for a long distance, perhaps from Cape Fear as far as Cape Race. He entered the mouth of the river later called the Hudson and is the first European on record to do so. His narrative provides the earliest description of many of the characteristic features of the coast. At one point he saw open water beyond low-lying land, such as the narrow islands which protect the Albemarle and Pamlico sounds, and he guessed that this might be the much-sought Southern Sea. In consequence, many of the maps of the ensuing years represent a vast gulf of the Pacific, entering from the west and occupying the larger part of the northern continent, being separated by a narrow isthmus from the Atlantic. In 1534 and 1535 Jacques Cartier entered the Gulf of St. Lawrence and sailed up the river as far as the present site of Montreal, where he heard of the Great Lakes—another hopeful clue to the longed-for water passage to the east. During the second half of the century, attempts at settlement led to a more careful determination of the details of the north Atlantic coast. St. Augustine was founded in 1565. Raleigh's famous "lost colony" on the Carolina or "Virginia" coast was established in 1587, and the attempts to determine the fate of the settlers led to several voyages during the next two decades, by means of which the coast was more or less carefully examined from New Jersey southward. Farther north, the work of Gosnold in 1602, Pring in 1603, Champlain and Weymouth in 1605, and in 1609 Hudson, who entered the river bearing his name, marked out the courses which were followed year by year by a constantly increasing number of vessels.

Champlain settled Quebec in 1608, and began the systematic exploration of the interior by visiting the lake which preserves his name in 1609. In 1615 he penetrated to Lake Huron. Traders and missionaries year by year pushed their way farther up the river and along the lakes. Père Allouez, in 1665, founded a mission on the southern shores of Lake Superior, and in 1672, accompanied by P. Dablon, he made a tour through Wisconsin and Illinois. A year later Marquette and Joliet reached the Upper Mississippi. In 1679 La Salle began his career by a voyage from Niagara to the southern end of Lake Michigan. Hennepin, one of La Salle's companions, crossed to the Mississippi, which he followed up as far as Minneapolis in 1680. Two years later La Salle made a trip down the Ohio to the Mississippi and on to the Gulf of Mexico, establishing the claim of France to the whole of the interior of the continent.

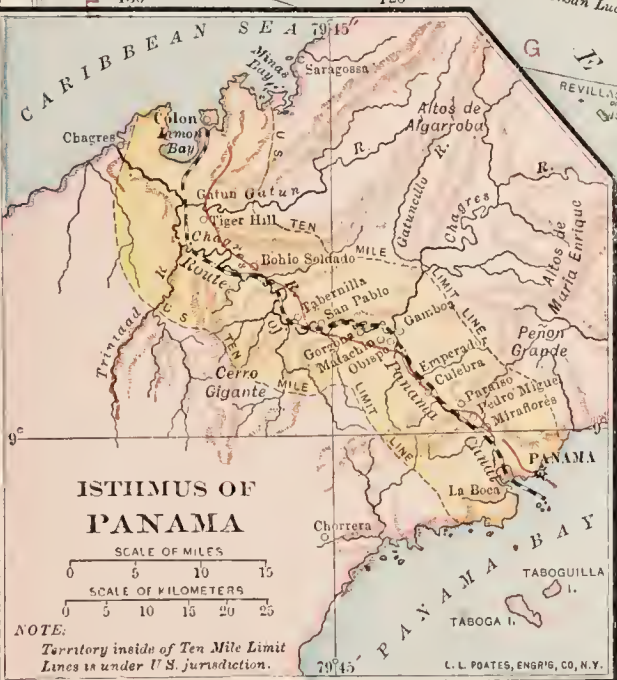
Henry Hudson, in 1610, entered the bay to which his name has been attached, and there, with several others, he was left in an open boat by his mutinous sailors. Some years earlier, in 1592, Juan de la Fuca, in a Spanish vessel, prob-



NORTH AMERICA



Important towns are shown in heavy face type
Important Railroads — Canals



ISTHMIUS OF PANAMA
SCALE OF MILES
0 5 10 15
SCALE OF KILOMETERS
0 5 10 15 20 25

NOTE: Territory inside of Ten Mile Limit Lines is under U.S. jurisdiction.

L. L. POATES, ENGR'G, CO., N.Y.

100° Long. West 90° from 80° Greenwich 70°

ably entered the sound on the western coast which was more carefully explored and named by Captain Vancouver exactly 200 years later, and carried home a report that he had seen a vast stretch of open water extending eastward. The attempts to find a way between these two bays, the search for the Northwest Passage, belongs to the article on Arctic discovery. The discovery of the interior of Canada was largely accomplished by the trappers and agents of the Hudson's Bay Company, which was organized in 1670; but it was not until 1738-1743 that Pierre Gaultier Varenne de la Verendrye and his sons made known the vast extent of the country lying east of the northern Rocky Mountains. The sons went as far as, probably, the Wind River Mountains, in 1742-43. In 1769-72 the fur-trader Hearne traced the Coppermine River to the sea, and in 1793 Mr. (afterward Sir A.) Mackenzie, while crossing the continent for the first time north of Mexico, from the Atlantic to the Pacific, discovered the course of the river to which his name has been given. In 1776 Escalante and Dominguez, two Spanish priests, traveled north from Santa Fé to Utah Lake, thence south to the upper Virgin River, and east and south to Zuñi and Santa Fé.

The real exploration of what is now the western part of the United States did not begin until after the republic had acquired some of that region. As soon as the Louisiana purchase had been concluded, Jefferson dispatched Lewis and Clark to investigate the course of the Missouri and determine its relation to the Pacific, which they did by descending the Columbia to the sea, their journey occupying the years 1804-06. Pike, meanwhile, was traversing the country between the head waters of the Mississippi and Red rivers, and afterward, 1806, he went to the Rocky Mountains south of the peak which now bears his name, but which he did not climb, examining it from another height. Pike's Peak was named by Long, James Peak, after his botanist, who was the first white man on record to reach its summit. Pike trespassed on Mexican territory and was captured, being later released in Mexico. He did not find the Red River of that region of which he was in search.

Among the other explorers of the United States in the first half of the nineteenth century were Ogden, General Ashley, Jedediah Smith, Joseph Walker, James Bridger, Long, Bonneville, Schoolcraft, Catlin, Nicollet, and Frémont. Among their successors in the second half of the century were Ives, Wheeler, Whitney, Hayden, and Powell. The list of explorers of British America and Alaska in the nineteenth century embraces Sir John Franklin, Back, Richardson, Beechy, Dease, Simpson, and Rae, whose activity lay in the realm of Arctic exploration, and Bell, Selwyn, Dawson, Dall, Muir, Allen, Schwatka, Ogilvie, Russell, and Low. Of the many explorers of South America in modern times mention may be made of Humboldt, Maximilian of Wied, Spix, Martius, Auguste de Sainte-Hilaire, Orbigny, Pöppig, the brothers Schomburgk, Darwin, Avé-Lallemant, Tschudi, Castelnau, Burmeister, Herndon and Gibbon, Chandless, Crevaux, Bates, Karl von den Steinen, and Ehrenreich. Among the explorers of the Andes in recent times have been Reiss, Stübel, Whymper, Fitzgerald, and Conway.

Colonization. Before Columbus left the newly discovered West India Islands in January,

1493, he built a fort on Española, now Haiti. Here some 40 of his sailors remained to form a settlement which should serve as headquarters for the further discoveries that Columbus expected to make as soon as he could return to the new world. These first Spanish colonists were killed by the Indians, but their places were taken by others, numbering between 200 and 300, who accompanied Columbus on his second voyage. During the early months of 1494 the town which they built, named in honor of the Queen, Isabella, rapidly assumed the appearance of a flourishing city. During the next 10 years a constant stream of settlers, many of them accompanied by their families, flowed from Spain into the new city. Many of these remained there to practice the trades necessary to town life, while others took farms near by or went on to assist in building up the newer towns which were being established at every good harbor and in the mining districts. These places became in a surprisingly short time practically self-supporting, and they were soon able to supply men and equipment for further exploration. Cortes drew from Cuba whatever he needed for his enterprise of 1519, a debt which Mexico repaid by furnishing the supplies for the large expedition which Vasquez Coronado led through the present Arizona and New Mexico to the great buffalo plains of the Mississippi valley in 1540-41. Moreover, Almagro and Pizarro drew from Panama the means for their adventurous expeditions into Peru and Ecuador, and these countries furnished the supplies to send Valdivia southward into Chile (1540), and Orellana and Ursua (see AGUIRRE) to explore the trans-Andean regions. By 1550 the Spanish-American settlements were firmly established, with every prospect of developing into powerful and wealthy colonies. Unluckily, the home government in Spain persisted in retaining all the administrative authority in the hands of officials appointed in Europe. As a result, the colonists were subjected to a succession of incompetent, corrupt governors, ignorant of American conditions, and desirous only of securing the greatest annual revenue for themselves and for the royal treasury. Deprived of all the incentives of public service, the Spanish-Americans suffered a steady decline in social and intellectual tone, very similar to that which was so noticeable in the northern English colonies between 1690 and 1750. Missionary zeal supplied almost the only active force for extending the colonial limits. The Jesuits built up a very remarkable domination over the natives along the upper Paraná and Paraguay, and north of Mexico the Franciscans, although driven out of New Mexico by the native "rebellion" of 1680, eventually succeeded in laying the foundations for permanent settlements in that region. During the eighteenth century there was a flourishing provincial life along the upper Rio Grande del Norte, the strength of which may be inferred from the fact that the first printing press west of the Mississippi, in what is now United States territory, was set up about 1737 in the town of San Fernando de Taos, New Mexico, which is still many miles from any railway. The Franciscans, Dominicans, and Jesuits sent their friars into Alta, or Upper California, and the mission buildings whose ruins are now so carefully cherished were begun at San Diego in 1769. Before the end of the century 17, in all, had been established, and by 1820 three more were

added, making a total of 20. Soldiers and ranchers followed the priests, and by 1800 the Spanish settlements were scattered thickly along the Pacific coast as far north as the Bay of San Francisco, and they were numerous in New Mexico in the valley of the Rio Grande.

Portugal began to colonize the eastern coast of South America in 1531, in order to maintain its claim to what is now Brazil against the Spanish, who were locating everywhere else on the new continent. A few settlements along the coast, however, were all that resulted until early in the eighteenth century, when the Portuguese tried to develop the country as a substitute for the East Indian possessions which the English and Dutch had taken from them. There was little European impress upon the country, however, before 1808, when the Portuguese court emigrated to Rio de Janeiro, which became for a while a pseudo-European capital. In 1821 King John VI went back to Portugal, but he left his eldest son, Dom Pedro, as Emperor. Extensive Brazilian estates were granted to his European retainers, and foreign capital began to be introduced. The country was developed for investment rather than colonization. There was no extensive taking up of the land by Europeans until the second half of the nineteenth century, when Italians, Germans, and Poles turned their attention to this region.

The French colonization of North America began with De Monts' settlement on the Bay of Fundy in 1604. The English (see ARGALL) effectually stopped all efforts to extend these settlements along the Maine coast, and so Champlain undertook to open up the interior by way of the St. Lawrence River. Quebec was settled in 1608 and Montreal in 1642; but these towns grew rapidly as trading and shipping places rather than as centres for colonization. A few other towns were started along the lines of communication with the trapping and hunting regions around the great lakes, as headquarters for trade with the Indians. As the competition with England for the possession of the country south of the lakes became keen, military posts, of which Fort Duquesne is the best known, were established on the Ohio and the Mississippi, to emphasize and protect the French claims. Nowhere was there much actual possession of the soil. When, in 1763, England secured the whole of French North America east of the Mississippi, the greatest part of it was open for settlement by her own people.

The English, like the other European nations, began by establishing outposts, first for the fishermen on Newfoundland before 1570, and in 1585 on the Carolina coast for the purpose of extending the search for gold and treasures inland. Religious and political conditions, however, changed the character of the English emigration to America soon after 1600. In 1620 and 1630 the Pilgrims and Puritans established themselves along Massachusetts Bay, with the deliberate purpose of becoming permanent inhabitants of the country. A few years earlier, in 1607, a Church of England colony had been attempted at Sagadahoc, now Popham Beach, on the Maine coast; but it made no permanent impression on New England. The same year a settlement was started at Jamestown, in Virginia, a successor to Raleigh's "lost colony" of 1587; and after many vicissitudes this gradually acquired a permanent character. The English Roman Catholics had held themselves ready to emigrate if

necessary throughout the reign of Elizabeth, but it was not until 1634 that they prepared a place for themselves in Lord Baltimore's grant of Maryland. The development of New England, beginning with the "great immigration" of 1630, was very rapid. In 1635 the "Bay Colony" was able to spare a large body of people, who, disagreeing with the majority in some minor matters of doctrine, preferred to live by themselves along the Connecticut River. A year later, others who differed from the Boston elders in opinions regarding more vital points of dogma formed the Providence Plantations as a refuge for those who desired religious liberty. The Southern colonies were settled more slowly, the formal organization of colonial governments (the Carolinas in 1663 and Georgia in 1733) being brought about partly by the necessity of counteracting the extension of the Spanish settlements north and west from St. Augustine (founded in 1565). St. Augustine and Chamita, New Mexico (founded 1598), are the oldest European towns in the United States. Santa Fé was founded in 1605.

The Dutch promptly organized trading posts along the river explored by Hudson in 1609, and sent over a large body of colonists during the next 10 years to hold the country. Rivalry with the English on the east, and with the Swedes, who settled on the Delaware in 1638, prepared the way for the absorption of the latter by the Dutch in 1655, and in turn for the occupation of the Dutch territory by the English in 1664.

French trappers and frontiersmen wandered up and down the Mississippi and along its western tributaries in steadily increasing numbers from the time of La Salle's voyage down the river in 1682. By 1803, the year of the Louisiana purchase, these men and their descendants were scattered widely over the western plains, drawing their supplies from the large village at St. Louis or the small town of New Orleans. Poli-

I. Independent States of the American Continent and Islands:

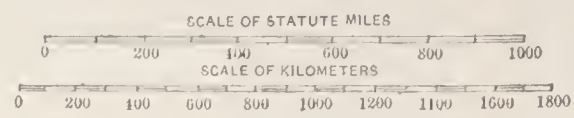
	Area in square miles	Population	Date
United States.....	2,974,000	91,972,000	1910
Alaska.....	591,000	64,000	1910
Hawaii.....	6,400	192,000	1910
Porto Rico.....	3,600	1,118,000	1910
Canal Zone.....	474	75,000*	1911
Total.....	3,579,474	93,421,000 ¹	
Mexico.....	767,000	15,115,000	1910
Guatemala.....	48,000	1,992,000*	1910
Salvador.....	8,000	1,161,000*	1912
Nicaragua.....	49,000	600,000*	1910
Honduras.....	46,000	553,000	1910
Costa Rica.....	23,000	388,000	1911
Cuba.....	44,000	2,220,000	1910
Haiti.....	11,000	2,029,000	1909
Santo Domingo.....	19,000	675,000*	1912
Panama.....	32,000	336,000 ²	1911
Colombia.....	461,000	5,476,000	1912
Venezuela.....	394,000	2,743,000*	1912
Brazil.....	3,290,000	23,071,000*	1911
Ecuador.....	115,000	1,500,000*	1910
Peru.....	695,000	4,500,000*	1908
Bolivia.....	708,000	2,450,000*	1912
Chile.....	292,000	3,415,000	1910
Argentina.....	1,153,000	7,171,000*	1910
Uruguay.....	72,000	1,177,000	1911
Paraguay.....	172,000	715,000*	1908
Total for Independent States.....	11,977,174	170,708,000	

* Estimated.

¹ Not including persons in military and naval service abroad, the Philippines, Guam, and Tutuila.

² Canal zone not included.

SOUTH AMERICA



Important towns are shown in heavy face type
Railways shown thus



II. European Dependencies:

	Area in square miles	Population	Date
BRITISH POSSESSIONS:			
Canada:			
Ontario.....	407,000	2,523,000	1911
Quebec.....	707,000	2,002,000	1911
Nova Scotia.....	21,000	492,000	1911
New Brunswick.....	28,000	351,000	1911
Manitoba.....	252,000	455,000	1911
British Columbia.....	356,000	392,000	1911
Prince Edward Island...	2,100	93,000	1911
Saskatchewan.....	252,000	492,000	1911
Alberta.....	255,000	374,000	1911
Northwest Territories...	1,242,000	17,000	1911
Yukon.....	207,000	8,000	1911
Total for Canada.....	3,729,100	7,199,000	
Newfoundland.....	42,700	238,000	1911
Labrador.....	120,000	4,000	1911
Bermudas.....	19	19,000	1911
British Honduras.....	8,600	40,000	1911
Bahamas.....	4,400	56,000	1911
Barbados.....	166	172,000	1911
Jamaica ¹	4,400	831,000	1911
Windward Islands:			
Grenada.....	133	67,000	1911
St. Vincent.....	150	42,000	1911
St. Lucia.....	233	49,000	1911
Trinidad.....	1,754	330,000	1911
Tobago.....	114		
British Guiana.....	90,277	296,000	1911
Falkland Islands.....	6,500	3,300	1911
Leeward Islands:			
Antigua ²	170	39,000	1911
Virgin Islands.....	58	5,600	1911
Dominica.....	291	34,000	1911
St. Christopher.....	65	26,300	1911
Nevis.....	50	13,000	1911
Anguilla.....	35	4,000	1911
Montserrat.....	32	5,600	1911
Total for British Possessions.....	4,009,247	9,473,800	
FRENCH POSSESSIONS:			
St. Pierre and Miquelon...	96	6,000	1907
Guadeloupe.....	688	212,500	1911
Martinique.....	385	184,000	1911
Guiana.....	34,060	32,000	1907
Total.....	35,229	434,500	
DANISH POSSESSIONS:			
Greenland.....	46,740	13,500	1911
Santa Cruz } St. Thomas } St. John }	138	27,086	1911
Total.....	46,878	40,586	
DUTCH POSSESSIONS:			
Surinam (Guiana).....	46,000	86,200	1911
Curaçao ³	403	54,500	1910
Total.....	46,403	140,700	
Total for Dependent States	4,137,757	10,089,586	
Total for American Continent and Islands.....	16,115,231	180,797,586	

¹ Including Caicos Islands.
² Including Barbuda and Redonda.
³ Including the islands of Bonaire, Aruba, St. Martin, St. Eustache, and Saba.

tics was largely responsible for the annexation, in 1845, of Texas, and the same force, acting in advance of economic or agricultural reasons, led to the organization of the emigrant aid societies in 1854 to hasten the settlement of Kansas and Nebraska. Gold was discovered in California at least as early as 1841, but it was the dramatic discovery in 1848, at Sutter's Mill, that excited the world. Its discovery in Nevada a decade later, and in the Klondike in 1897, resulted in opening up those regions. For further information, see special articles under the political divisions of the continent.

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AMERICA. An American national hymn, by the Rev. Samuel F. Smith (1832). The melody, ascribed to Henry Carey (1742), is identical with that of the English national anthem, "God Save the King," and, popular in France from 1775, became national in Denmark, Germany, and Prussia. Consult E. Bohn, *Die Nationalhymnen der europäischen Völker* (Breslau, 1908).

AMERICA. The name of the schooner-yacht which in the international yacht race of 1851 won the cup since known as the "America's Cup." See YACHT.

AMERICAN, THE. A novel published in 1877 in Henry James's "earlier manner." The central character, Christopher Newman, while traveling in Europe for pleasure, falls in love with a Frenchwoman of noble birth. The way in which James brings out the inevitableness of Newman's failure in his suit for her hand is the striking feature of the book.

AMERICAN ALL'SPICE. See CALYCAN-THUS.

AMERICAN AL'OE. See AGAVE.

AMERICAN AS'SOCIA'TIONS AND SOCI'ETIES. For descriptions of associations and societies whose official titles begin with the word "American," see names of subjects in which such organizations are interested. Example: For the American Academy of Political and Social Science, see POLITICAL AND SOCIAL SCIENCE, AMERICAN ACADEMY OF.

AMERICAN BAP'TIST MIS'SIONA'RY UNION. See MISSIONS.

AMERICAN BLIGHT. A term used abroad for the injurious effects upon trees or plants of plant-lice of the cosmopolitan genus *Schizoneura*, especially *Schizoneura lanigera*. For a general description of the ravages of plant-lice and the best methods for their destruction, see APHID. Consult *Circular No. 20*, Div. Entom., U. S. Dept. Agriculture (Washington, 1898).

AMERICAN BOARD OF COMMIS'SION-

ERS FOR FOREIGN MIS'SIONS. See MIS-SIONS.

AMERICAN COM'MONWEALTH', THE. A historical and critical work on the social and political institutions of the United States, by the Right Hon. James Bryce (q.v.). It was first published in 1888. A much enlarged edition appeared in 1893-95, and a new edition, completely revised by the author and with additional chapters, was published in 1910. Whether considered as a text-book for colleges and universities, or as a guide for the average reader who wishes to understand the structure and true spirit of the institutions of the United States, *The American Commonwealth* is probably the most authoritative and widely read work on the subject of which it treats.

AMERICAN COUS'IN, OUR. One of the best known plays of the English dramatist, Tom Taylor (1858), very popular a generation ago. The unimportant character, Lord Dundreary, became in the clever creation of E. A. Sothorn a great part. For Americans, however, the drama must always possess melancholy associations, for it was while enjoying its presentation that Lincoln was assassinated.

AMERICAN FLAG, THE. See FLAG.

AMERICAN FORK. A city in Utah Co., Utah, 32 miles south of Salt Lake City, on the Denver and Rio Grande and the San Pedro, Los Angeles, and Salt Lake railroads (Map: Utah, C 2). Pop., 1900, 2732; 1910, 2797.

AMERICAN IN'STITUTE OF THE CITY OF NEW YORK. An organization to promote, by means of exhibitions and fairs, the interests of agriculture, commerce, manufactures, and arts in the State and country. The institute was founded in 1828, and its fairs attracted wide attention from investors and capitalists. Among the inventions which received early recognition from the institute were the McCormick reaper, the sewing machine, Colt's fire-arms, the type revolving and double power printing press machines, the first anthracite coal burning stove, the Morse telegraph, the stocking loom, the telephone, and the Francis metallic lifeboat and life-saving appliances. The American Institute now embraces in its organization five sections: The Farmers' Club, the Electrical Section, the Horticultural Section, the Photographic Section, and the Polytechnic Section. It has a valuable scientific library of over 15,000 volumes.

AMERICAN IP'ECAC. See GILLENIA.

AMER'ICANISMS. Words and phrases peculiar to the United States. They are classified by one writer on this subject (Bartlett) as follows: 1. Archaisms, obsolete, or nearly so, in Great Britain. 2. English words used in a different sense. 3. Words used in the original sense in the United States, although not in Great Britain. 4. English provincialisms adopted into general use in America. 5. Newly coined words owing their origin to productions or circumstances of the country. 6. Words derived from European languages, especially the French, Spanish, and Dutch. 7. Indian words. 8. Negroisms. 9. Peculiarities of pronunciation. Accepting for the present this arrangement, we may cite as examples of archaisms, *fall*, for autumn, *freshet*, to *lam*, in the sense of to beat, to *squelch*, and to *tarry*. These are only a few; for an American philologist has stated that of the words, phrases, and constructions found in the Bible and Book of Common Prayer, "about one-sixth, which are no longer used in England

in ordinary prose-writing, would apparently be used without thought or hesitation by an American author." Among the many English words used in a different or perverted sense are *barn* for stable; *boards*, for deals; *buggy*, a four-wheeled vehicle—in England, two-wheeled (but the word itself is Anglo-Indian); *calico*, printed cotton, in England means unprinted; *clever*, for good-natured—in England, generally, intelligent or skillful; *corn*, for maize, whereas in England it means wheat, in Scotland, oats, and in Ireland, barley; *cracker*, for biscuit; *depot*, for station; *dress*, for gown; *forehanded*, well-to-do—in England, means timely, early; *hack*, a hackney coach—in England, a hired horse; *homely*, plain-featured—in England, homelike or unadorned; to *jew*, to haggle—in England, to cheat; *likcly*, for promising; *lumber*, for timber; to *mail*, for to post; *notify*, to give notice—in England, to make known; *pond*, a natural pool of water—in England, artificial; *reliable*, for trustworthy; *saloon*, for tap-room; *smart*, for talented; *smudge*, a smoldering fire used to drive away insects—in England, simply an overpowering smoke; *store*, for shop; *tavern*, for inn (a tavern in Great Britain provides no lodgings); *temper*, with us meaning passion, is in England control of passion; *ugly*, for ill-natured; *venison*, deer's flesh—in England, meat of any wild animal; *track*, for line; *vest*, for waistcoat. We use also, in large number, different words for the same thing, as *conductor*, for guard; *editorial*, for leader; *elevator*, for lift; *horse-car*, for tram, and *sleeper*, for tie. One must here note that *argot* and genuine slang are scarcely to be regarded as necessarily either American or British, for in the underworld of both nations they are intelligible. So *graft*, *the push*, *in the swim*, *the stir* (prison) and hundreds more.

Examples of words retaining here their old meaning are: *Fleshy*, in the sense of stout; *offal*, the parts of a butchered animal not worth salting; *sick*, in the sense of ill; and *wilt*, in the sense of wither. On the other hand, to *heft*, meaning with us, to weigh by lifting, keeps, in England, its original meaning, to lift. Many words called archaic or provincial by English writers are widely current among Americans in both speech and literature—among them adze, affectation, angry (wound), andiron, bay-window, bearer (at a funeral), to blaze (a tree), burly, cesspool, clodhopper, counterfeit money, cross-purposes, deft, din, hasp, loophole, ornate, ragamuffin, shingle, stand (speaker's), stock (cattle), thill, toady, tramp, truck, and underpinning. Among newly coined words and expressions are these, showing plainly their origin on the frontier or in the forest: backwoods, cache, clearing, to draw a bead, to fight fire, a gone coon, salt-lick, hogwallow, logging camp, prairie schooner, raft (of dead trees), squatter, squawman, the timber, and trapper. Ranch life has given us such words as corral, cowboy, roundup, and stampede; the mining regions, bed-rock, diggings, to pan out, to prospect, and to stake a claim. From the farm and plantation we have obtained among others, bagassee, broom-corn, Hessian fly, Indian meal, and truck-patch; while trade has supplied us with bogus, drummer, posted up, and to settle (a bill). Many others might be added from the language of Wall Street. Our political terms and phrases include the following, most of which are the subject of special articles in this *ENCYCLOPÆDIA*; Agri-

cultural wheel, barnburner, bloody shirt, boodle, buncombe, carpet-bagger, caucus, copperhead, to eat crow, dark horse, doughface, favorite sons, fence-riding, F. F. V.'s, filibuster, fire-eater, gerrymander, half-breed, hoodoo, stalwart, hunter, jayhawker, Ku-Klux-Klan, loco-foco, log-rolling, Lynch law, Teddyite, graft (London argot), Mugwump, omnibus bill, pipe-laying, plank, primary, reconstruction, salt river, shin-plaster, spellbinder, squatter sovereignty, Greenbacker, wire-puller, Yazoo fraud.

Words derived from foreign languages are numerous and one philologist (W. W. Crane) asserts that, though few are intelligible to English people, they are more extensively used by Englishmen than is generally supposed, and "form the really distinctive features of what may be termed the American language." Thus, from the Spanish we have in corrupted or contracted form, beno (*vino*), creole (*criollo*), garrote (*garrota*), jerked beef (*charqui*), key, a small island (*cayo*), lasso (*lazo*), mustang (*mesteño*), pickaninny, contracted to *pickney* in S. C. (*pequeño niño*), Sambo (*Zambo*, a person of negro and Indian blood); stampede (*estampedo*); and such literally appropriated words as adobe, bonanza cañon, beano (*vino*) and mesa. From the French have been obtained among many, bayou (*boyau*, a trench), cache or cash (*acher*), chowder (*chaudière*), shivaree (*charivari*; Low Lat. *charivarium*), metif, an Indian half-breed (*métif* or *métis*), mascot, and the identical butte, levee, portage, prairie, and voyageur. From the Dutch have come boss, an overseer or superior (*baas*); used also in England but there derived from South African Dutch; cold slaw, cabbage salad (*kool slaa*); cruller (*kruller*, to twist); hook, a point of land (*hoek*, a corner); noodles, an imitation of macaroni (*noodlejes*); overslough, to supersede or defeat (*overslaan*, to skip or pretermitt); stoop or stoup, the step or steps of a house (*stocp*). Kill, a small stream, retains both its old sound and spelling, and Santa Claus (*Klaas*) receives as much respect as before the slight change in his name. The Germans have contributed bumper (*bummler*, a braggart, a loafer), pretzel, and dude.

From the Indian we have chinquapin, a kind of oak (Va., Algonquian, *che-chicnamin*); hominy (Va., Algonquian, *custathominy*); moccasin (Mass., Algonquian, *mockisin*); opossum (*appasum*); pow-wow (*powan*, a prophet or conjurer); raccoon (Algonquian, *aroughcūn*); sachem (*sakemo*); skunk (Abnakis, *secanu*); succotash (Nanaheganset, *mcsimotash*); toboggan (*odabogan*); tomahawk (Algonquian, *tamahagan*, a war-club); wigwam (Natic, *weecwahm*), tepee and wick-i-up, and mush (Alaskan, meaning "start," "get-up" as addressed to an animal). Among words introduced or invented by the Southern negroes are: brottus, a small gift (Ga.); buccra, a white man; corn (harvest) songs (Md.); cracklings or goody-bread, bread containing roasted pork-rinds; enty? is that so? (Sea Islands); goober, a peanut (W. African *guja*, or Guinea *gobbe-gobbc*, Va. and N. C.); lagniappe, a tradesman's gratuity (Sp. *ñapa*, La.); moonack, a mythical animal; pickaninny, and pinder, a peanut (Fla.); while the Chinese word kowtow or kotow, salutation by prostration, has (or had) a limited use in the sense of obsequious politeness.

In the matter of pronunciation, slight differences exist. The word *trait*, for instance, is pronounced *tray* by the English, the *i* in *sliver* is

lengthened by them, and *schedule* is commonly pronounced *shedule*. We may mention here that *cheerful* retains in some parts of the South its old pronunciation, *cherful*. In the pronunciation of proper names, English and American usages frequently disagree. In England Ralph is pronounced Rafe; Brownell, Parnell, etc., are accented on the first syllable; Powell is Pool, and Howells is Hools (both of these Welsh); the last syllable of Gladstone is sounded short. With English surnames and geographical names cultivated Americans should seek to follow English usage. In Christian names Englishmen generally use only the first, while Americans always give the full form. In England we read of Ralph Emerson, Edgar Poe, etc. What have been termed by Grant Allen "Americanisms in spelling," examples of which are *labor*, *offenses*, and *theater*, are undoubtedly the result of the extensive use of Webster's spelling-books and dictionary and the recent agitation for a simpler spelling, as *tho*, *thru*, etc.

Americanisms are classified by Reeves as follows: (1) Eastern dialects; (2) Southern; (3) Western; (4) Pacific or mining; and he adds as a possible (5) English-Dutch (German) of Pennsylvania. This convenient arrangement enables us to separate such words and phrases as are limited to particular sections or localities (provincialisms) from those that may be called national. Beginning with New England, we have: to *admire*, for to like, e.g., "I should admire to go"; to *allot*, or *'lot*, for intend; *barm*, for yeast; *be*, for am or are; *bettermost*; *blob*, a blossom; *blowth*, blossoming time; *bungtown copper*, a counterfeit; to *calculate*, for to infer or suppose; *empti'n's*, any dregs; to *fail up*; to *fay*, for to fit; *fore-chamber*, a front bedroom (Me.); *gawnicus*, a dolt; *grayslick*, a glassy stretch of water (Me.); *Hessian*, as a term of reproach; *like*, without a specified object, as "How did you like?" (a place, person); *long-favored*, tall; *mush-muddle*, a potpie (Cape Cod); *pew-cart*, a box-like carriage (Nantucket); *pleasant*, for pleasing; *pokeloken*, a marsh (Me.); *priest*, for a clergyman of any denomination; *pung*, a kind of sleigh; *rifle*, a whetstone for scythes; *sconce*, for discretion, like the French *bonne caboche*; to *seep*, to pour through a sieve or hole; *slip*, for pew; *spero*, a common-place entertainment, "small doings" (Vt.); *staddle*, a sapling; *suant* or *sucnt*, level, uniform; to *sugar off*, to boil maple syrup down until it grains; *tackling*, for harness; *timbers*, for skeleton of a whale; *torsh*, the youngest child (Cape Cod); to *train*, to move briskly (like the militia on "training day"), to frolic; *vestry*, the chapel or lecture-room of a non-liturgical church; *v'y'ge*, for voyage; *wopper* (or *whopper*-) *jawed*; *wicket*, a hut or shelter of boughs (Me.); *winegar*, for vinegar (Essex Co., Mass.); *York shilling*, ninepence. In New York State, among localisms derived from the Dutch, are *bockey*, a gourd-dipper; *fyke*, a bow-net; *hoople*, a child's hoop; *pile*, an arrow, and *scup*, a swing, a name still used by children of foreign parentage on the "east side" of New York City. *Slip*, an opening between wharves, is apparently an indigenous English word; the provincial English *duff*, dough or paste, signifies, in the Adirondacks, fallen and matted hemlock needles; and *dimpy* (probably from the English *dimpsy*, a kind of preserve) is the name given in some places to a tea-party, or a small social gathering at which refreshments are

served. New Jersey, settled, like New York, both by English and Dutch, preserves in remote localities some Old World words, or perversions of the same; for example, *blickie*, a tin pail; to *heir to*, to inherit; *jag*, a small load; *mux*, disorder, and *piece*, a cold meal hastily prepared, or one for farm hands. Examples of the provincialisms of Pennsylvania, which were introduced by the English, Scotch-Irish, and Germans, and in many instances have been carried beyond her borders by emigration, are: *after-night*, for after candle-light; *Aprile*, for April (Cumberland valley); *barrick*, a hill; *bealing*, suppurating; *brickle*, brittle; *dipsey*, the sinker of a fishline; *dozy*, timber brittle from decay; *fouty*, trifling; to *get shut*, to get rid; *gums*, for overshoes (eastern Pa.); *horsebeast*; to *lift*, a collection in church, to take up; *onec*, immediately; *outcry*, public auction; *riffles*, ripples; *scrapple*, an article of food (Philadelphia); *slave*, a fierce dog, i.e., needing to be chained (western Pa.); to *smouch*, to kiss; *sots*, common yeast; to *top* (a candle), to snuff; to *thrcap*, to argue; *yammer*, a whine or whimper; *pig-people* (New Jersey), the same as "poor white" in the South.

The South has retained fully as many old English words and pronunciations as New England and has originated some of the most expressive terms used in ordinary conversation, a number of which, by migration, have been domesticated in the West and on the Pacific coast. Among them are *afcaired*, afraid; *amber*, expectoration produced by chewing tobacco (Va., Carolina); *beast*, horse; *branch*, a stream of any size; *bucket*, pail; *brogan*, a kind of boat (Chesapeake Bay); *castaway*, overturned; *central*, central (Va.); to *chunk*, to throw a missile; *coppen*, cow-pens; *complected*, having a certain kind of complexion; *condeript*, thrown into fits (Ky.); *corn-dodger*; *cracker*, a poor white (Ga., Fla.); *dinghy*, a kind of row-boat (Fla.); *dismal*, a swampy tract of land (N. C.); *docious*, for docile; *donock*, or *donnock*, a stone (Southwest); *escalan*, a kind of coin (La.); *evening*, afternoon (also in Illinois); *feaze* or *feeze*, *faze*, an excited state; *fice* or *phyce*, a small dog, cur; *French*, anything distasteful (Va., Md.); *grundpy*, groundpea (Tenn.); *gum* or *bee-gum*, a hive made from a hollow tree; *gumbo*, okra, or a dish made of it; *gumbo*, a patois; *hammock* or *hummock*, a peculiar kind of land, often hilly (Fla., Texas); *hoe cake*, a corn cake once baked on a hoe; *holpen*, helped (biblical); *honey-fogling*, for cheating or coaxing; *hot*, hit; *howdy*, how do you do?; *human*, for person; *Jeames*, James (Ind., Va.); *kiver*, cover; *lane*, any inclosed road; *lightwood*, pine chips or knots; *marooning*, picnicking or traveling by carriage; *mammoxed*, seriously injured; *marvel*, for marble; *maverick*, an unbranded yearling (Texas and Southwest); *million*, melon; *necessity*, necessity; *or'nary*, contemptible; *paint*, a spotted horse; *peart*, lively, brisk; *pine-tag*, pine needle; a *pol*, a blow; *pone*, bread of Indian meal; *powerful*, very; *quarters*, farm buildings or out-houses inhabited by negroes; *rance snuffle*, a malignant act (Ga.); *rantankerous*, quarrelsome (Ga., but also N. Y.); to *reckon*, to suppose or conclude; *rock*, stone; *roustabout*, *savigerous* or *survigrouis*, fierce, alert (so cited by Mrs. Trollope); *slash*, low ground or an opening in the woods; *right smart*, great or considerable; to *scringe*, to flinch (Texas); *skygodlin*, obliquely (Texas); *swash*, a narrow channel of

water; *tackey*, neglected or dowdy; to *tarrify*, to coerce; to *tote*, to carry; *trash*, worthless or low-born persons, especially *poor white trash*; to *up*, used as a verb; *used*, used to; *you all*, of any number of persons; *you-uns*, for you.

The West, using the term in its old sense, which included the interior States as well as the Northwest and Southwest, in addition to words derived from the French and Spanish, some of which have already been cited, has brought into its vocabulary many peculiar words and expressions. Such are *after-clap*, a demand made after a bargain is closed; *Arkansas tooth-pick*, a kind of bowie-knife; *bad man*, a murderer; *bell mare*, the horse leading a drove of mules (Southwest); to *bear off*, to separate a stray "brand" by riding between it and the herd (Southwest); *bodewash* (*bois de vache*), dried cow-dung used as fuel (Southwest); to *build*, to make shoes (Ohio); to *buss*, to strike; *catawampous* or *catawamptious*, terribly or completely; *country*, for State or section; *cowbrute* (Mo.); *doggerly*, a grogshop; *drink*, river; *galoot*; to *take a gird*, for to make an effort; to *hustle*; *keener*, a sharp man; *lave!* (*lève*), get up! or rise up! (Mississippi valley); *locoed*, for frenzied, Sp. *loco* (Kansas and Southwest); *long sweetening*, molasses (Iowa, from New England); *main traveled road*, highway; *naked possessor*, one without title to his farm (Southwest); *oldermost*, oldest; *plumb sure*; to *pull foot*, to hasten; to *raise*, to obtain; *robbilæ*, pemmican boiled with flour and water (Northwest); to *slosh 'round*, to brag, also to frequent saloons (South and West); *sugar* or *sugar-tree*, maple; *sun-up*, sunrise; *swinger*, the middle horses in a team of six; *tenderfoot*, a newcomer; to *trash* (to cover) *a trail*; *every whipstick*, for continually, often; to *want down* or *up* (Ill.); *worm* (or snake) fence; to *zit*, to sound like a bullet striking the water. The Pacific slope is responsible for *adobe*, soil from which *adobe* bricks are made; to *bach*, to camp out without ladies; *Bostons*, white men in general (Or. Indian); *coulee*, *cooley*, a rocky valley (Or. and Wis.); *claim*, land to which one has a legal right; *claim-jumper*, one who forcibly takes another's claim; to *coyote*, to sink a small shaft (Cal.); *diggings*, a particular locality; *hardpan*; *heeled*, for armed; *pay-streak*, a profitable lode or vein; *rusher*, a person going to the mines; *tangle-foot*, bad liquor. Local usage differs greatly in connection with articles in common use. The Eastern *paper bag* is in the central West a sack, and in portions of the South a *poke*; a *scuttle* or *pail* is a bucket. The British *perambulator* is in the East a baby-carriage, and in the Central West a baby buggy or cab. A *comfortable* is a comfort. A distinction, furthermore, should be made between words that are used in large cities and those that are in the main confined to small communities. In the country, people *hire help* and *keep girls*; in the cities they have *servants* or *maids*; the city *nurse* is lengthened in the country to *nurse-girl*. The original English *folks* is now a provincialism in this country. Most of the New England words and forms used by Lowell in the *Biglow Papers* are provincialisms. Some Eastern provincialisms are in general use in the Central West.

Early writers on Americanisms were wont to stamp every odd or vulgar word and expression as American, with the lamentable result, as Richard Grant White complained, of creating a belief that there is a distinctive American lan-

guage, "a barbarous, hybrid dialect, grafted upon English stock;" the truth being that most of the so-called Americanisms were brought to this country by its early settlers, English, Scotch-Irish, Dutch, Germans, etc., and that many of them are now used only by the unlettered. The language of the "stage Yankee," and that of the characters in dialect-stories, Northern and Southern, are with few exceptions English, provincial or obsolete in the mother country, and not "American" in the true sense of the word. In the county of Suffolk, according to Lounsbury, the following "Americanisms" were current as recently as 1823: *Applc-fritters, by gum, ehaw, eutc, darnation, gal, gawky, hoss, ninny-hammer, ride like blazcs, sass (sauce), sappy and tantrum.* White prepared a long list of words and phrases supposed to be indigenous, and proved their British origin by citing early dates at which they appear in literature, or the names of authors in whose works they occur. Selecting from this list, and indicating by the letter "a." words known to be ancient, by "m." such as are here used in provincial speech, and by "Bible," King James' version, we submit the following: To *admire*, in the sense of to wish eagerly (Chapman's *Homer*, 1655); to *advocate* (Milton); *apart*, aside (Bulwer); *baggage*, luggage (Fielding, T. Hughes); *blizzard* (m.); *blow*, boastful talk (a., m.); to *bolt*, to rush or escape (Dryden); *bosom*, applied to a man (Shakespeare); *bulldoze* (W. Scott); *bureau*, for chest of drawers (Fielding, Hare); *by the skin of onc's teeth* (Bible); *catamount* (a.); *chaw* (1530, m.); *chore*, light work (Ben Jonson); *clean gone* (Bible); *clever*, good-natured (Elizabethan writers); *conclude*, resolve (Tyn-dale, Froude); *crevasse* (Chaucer); *deck of cards* (Shakespeare); *divine*, clergyman (W. Scott, G. Eliot); *elect*, for conclude or determine (Lord Thurlow, Ruskin); to *enjoy poor health* (m.); *fall*, for autumn (Cairne, 1552; Froude); *feel to*, as in the expression, "I feel to rejoice" (m.); to *fellowship* (Chaucer); *fix*, to put in place or order (Farquhar, Sterne); *fleshy*, stout (Chaucer, Professor Owen); *folks*, people (Byron, Bulwer Lytton); *gent* (Pope); *a good time* (Swift); *grain*, any cereal (Wiclif); *guess*, think or suppose (Wiclif, Milton, A. Trollope); *gumption* (a., m.); *heft* (Sackville, T. Hughes); *hclp*, servant (T. Hughes); *human*, person (Chapman's *Homer*); *lung*, hanged (Shakespeare, C. Reade); to *hustle* (a.); *illy* (a., m.); *influential* (W. Thompson, c.1760); *improvcment*, of an occasion, etc. (Defoe, Gibbon); *institution*, in the sense of an establishment of foundation (Beatty, 1784; Trollope); *interview*, to meet for conversation (Dekker); to *let on*, to divulge (m.); to *let slide* (Gower); *limb*, leg (Fielding); *love*, like (Cowper); *lucrative* (Bacon); *mad*, angry (Bacon, Middleton); *magnetic*, as an adjective (Donne); to *make a visit* (m.); *metropolis*, the chief city of the State (Milton, De Quincey, Macaulay); *million*, melon (Pepys); *musicianer* (Byron); *nicc*, pleasing or agreeable (a., m.); *notify*, to give notice (m.); *notions*, for small wares (Young); *overly*, excessively (m.); *parlor*, for drawing-room (G. Eliot, Helps); *pcruse*, scan or read (W. Scott); *professor* of religion (Milton); *pumpion* (pumpkin) pie (1615); *quit*, leave off (Ben Jonson); *railroad*, railway (J. H. Newman, Mrs. Trollope); *rare*, underdone (Dryden); *reliable* (Richard Montague, 1624;

Gladstone); *reckon*, suppose or conclude (Bible, W. Scott); *rock*, stone (a.); *run*, a small stream (a.); *siek*, ill (Bible, Evelyn); *skedaddle* (m.); *slick* (a.); *span new* (Chaucer); *spell*, a period of time (a.); *spruce*, neat (Evelyn); *spunky* (Burns); *swop, swap* (B. Jonson, Dryden); to *take on*, to wail or grieve (a.); *tend*, attend (Shakespeare); *town*, as a geographical division (Wiclif); *well*, prefacing a sentence (Disraeli); *Whittling* (Walpole); and the writer would add the following which are sometimes ridiculed as outlandish products of the New World: *A howling wilderness* (Bible); *Mr. — and lady* (Thackeray); and to *set store by*, in the sense of to prize or appreciate (Mrs. Oliphant). Gilbert M. Tucker says that the 460 words in Elwyn's *Glossary of Supposed Americanisms* are all of British origin; that in Pickering's work (1816) not more than 70 words out of the 500 are really American; and that out of the 5000 or more entries in Bartlett's *Dictionary*, only about 500 are genuine and distinct Americanisms now in decent use. Most New Englanders, said James Russell Lowell, speaking of colloquialisms still heard in Massachusetts, stand less in need of a glossary to Shakespeare than many a native of the old country. It may be added that many words formerly termed Americanisms are as commonly used in England as here, though not in polite speech or literature; e.g., *bamboozle, chockful, duds*, and *sight* for number, while, on the other hand, such old forms as *axe* for ask, and *housen* for houses, are frequently heard in England and rarely here.

Richard Grant White and T. R. Lounsbury limit the term "Americanisms" narrowly. According to the former, they must not have been transplanted, but must be perversions or modifications of English words or phrases, and must be used in the current speech or literature of the United States at the present day. "Words which are the names of things peculiar to this country are not Americanisms, except under certain conditions (*maize, squaw, wigwam*). They are merely names which are necessarily used by writers and speakers of all languages. If, however, any such word is adopted here as the name of a thing which already had an English name (*wigwam*, for hut or public hall; *squaw*, for wife), it then becomes properly an Americanism. *Indian*, and names compounded of *Indian*, were given by Europeans. Indian pudding is an American thing, but its name is not an Americanism." As he rejects *Indian summer, paleface, succotash, tomahawk*, and the rest, White asks, "What have we to do with the Indian?" and proceeding, crosses from the list of cherished "Americanisms," *bronco, lacrosse, stampede*, and their kin; *abolitionist, border-ruffian, gerry-mander, reservation*, etc., as well as *groundhog, long-moss, pine barrens*, and *saltlick*, to go further, besides refusing to discuss such words as *intervale* and *water-gap*, because they are "legitimate English." Lounsbury, like White, objects to the expression, "the American language," and remarks of the so-called "Yankee dialect" that it is never "the characteristic tongue of any one man, or of any one class, or of any one district." He doubts whether the term "Americanisms" can be regularly applied to *eent, eongress, mileage, nullification*, and so on, and prefers to call them "American contributions to the common language."

American newspapers are largely to blame

for the mongrel and high-sounding words heard in the United States, especially those derived from the Latin or the Greek. The oratory of political campaigns gives rise to not a few astonishing Americanisms and our humorists have coined many more that are beloved by the public. Persons of fair education, who, as we learn from their talk, *engage in avocations, reside in a mansion, wear pants, donate to charities, ride to the metropolis in a smoker, retire to bed, and have proclivities*, must be expected to use also *enthuse, funeralize, saleslady, and shootist*, when they find them in their favorite journals; but criticism under this head comes with little grace from the English, whose *leaderette* is as absurd as our *editorial paragraph*, and *agricultural laborer*, a clumsy name for him whom we term a *farmhand*. Our colleges, Yale in particular, are prolific in slang, some of which, as to *rattle*, in the sense of to confuse, soon become public property. Most of our colloquial expressions are short-lived, but the following may be instanced as having been in use for a long period: to *absquatulate*; *baggage-smasher*; to *bark up the wrong tree*; *bottom dollar*; *caboodle*; to *boost*; to *cavort*; *conription fit*; not to *carc a continental*; a *continental darn*; to *chip in*; *coon*, a colored man; a *coon's age*, an indefinitely long time; to *dust*, to leave quickly; to *euchre out*; to *flash in the pan*; *flatfooted*; *gum game*; *highfalutin*; *last o' pea time*; *level best*; to *liquor*; to *moosey*, to leave quickly; *hike*, to tramp; *obligated*; to *paddle one's own canoe*; to *pan out*; *picayune*, small, mean; to *raise Cain*; *right away*; to *run*, in the sense of to manage or conduct; to *salt a mine*; *sample room*, drinking-bar; *shoddy*, applied to a person; to *smile*, to drink spirits; *sockdologer*, a finishing blow or argument; to *sour on*; a *square meal*; to *strike oil*, to get rich suddenly; to *stump*, to puzzle, or challenge; to *talk turkey*, to brag; *tuckered out*; to *vamose* (Sp. *vamos*), to leave quickly; to *weaken*, to yield or give out; to *squeal*, to betray.

T. W. Higginson (see *Bibliography, infra*), in examining a glossary of the slang used about 1798 by British prisoners in the Castle in Boston Harbor, now Fort Independence, discovered a number of words that had been classed as of recent origin, the most familiar of which are *grub*, victuals; *douse the glim*, put out the light; and *spotted*, for found out. Also some that are not given in any English glossaries, as *briar*, a saw; *nipping-jig*, the gallows; and *wibble*, a dollar. Most of these expressions belong to the *argot* of thieves.

When we remember that the dialects of the countries in England have marked differences—so marked indeed that it may be doubted whether a Lancashire miner and a Lincolnshire farmer could understand each other—we may well be proud that our vast country has, strictly speaking, only one language. It is remarkable that the influx of European immigrants has not resulted in some States in reducing English to a *patois*, if not in extinguishing it, or in giving it scant room in a mongrel vocabulary. Again, it might reasonably be expected that, in the course of three centuries, the political and social changes which we have undergone, and the peculiar circumstances attending the settlement of new regions, would have separated us so widely from the mother country that, in spite of kinship and commer-

cial intercourse, some radical differences in language would have been evolved. The reason for a general standard in America is found in the wide use of text-books, such as the old Webster's speller; and because of the increasing foreign element in this country, our public schools are forced to devote much time to the teaching of English, a thing regarded in England as more or less unnecessary, because the stock is homogeneous. What has been styled "the American worship of the dictionary" has at least given us a definite standard and prevented anything like a *patois*. Increased intercourse with the English and a wider reading of English popular writers have tended to graft upon our speech a large number of words that would once have been unintelligible or at least purely British. Kipling, Conan Doyle, and Henry James may be cited as the three writers most responsible for this growing likeness of usage.

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AMERICANISTS, INTERNATIONAL CONGRESS OF, is an organization to promote the investigation of the origin and history of the native races of North and South America. The first congress was held in 1875, at the call of the

French Society of Americanists, an organization still in existence. As used by this society the term "Americanist" applies to any student of American anthropological problems. Previous to 1900 the organization was distinctly European, but at that date it was reorganized to hold biennial alternate meetings in Europe and America, the session of 1914 being in Philadelphia, Pa. The various American and European governments appoint two officials to attend the sessions in addition to the regular members of the association. For further details see the published proceedings.

AMERICAN KNIGHTS, ORDER OF. See KNIGHTS OF THE GOLDEN CIRCLE.

AMERICAN LITERATURE. A term applied rather loosely to the body of writings in the English language produced in the territory now occupied by the United States. It includes a period extending from 1608, when Captain John Smith's *True Relation* was published in London, to the present day. Strictly speaking, the works of Smith and of those of his contemporaries who did not make a permanent sojourn in the New World, belong rather to British than to American literature. Again, it is plain that the term "literature" must be used with considerable latitude, if it can be made to include the news-letters, the bare annals, the topographical treatises, the controversial pamphlets, the sermons and other theological lucubrations that form the bulk of the writings produced by the colonists of the seventeenth and eighteenth centuries. The paucity of the materials at their command has, however, induced American literary historians to give a hospitable reception to almost everything that can be called a book written in the American colonies or about them, whether published in England or at home after Stephen Daye had set up his press at Cambridge, Mass., in 1639.

Surprise has sometimes been expressed at the fact that Englishmen, contemporaries of Shakespeare and Milton, should, in their new environment, have written practically nothing of æsthetic value. The excuse is usually made for them that they had many more necessary things to do, such as felling the forests and keeping off the Indians. This excuse is certainly applicable, but it may be doubted whether the Puritan or the Cavalier stock that settled America would have been noted for great contributions to English literature had they remained in the mother country. The companions of Bradford and Winthrop would have done what writing they did on theological subjects; the companions of Captain Smith and the younger sons of royalist country gentlemen would have written little more than they did in Virginia. The colonial literature of the seventeenth century is chiefly valuable to the historian and the antiquarian. The early colonists wrote for utilitarian purposes. The Virginians wrote to convey information to their friends at home and to encourage emigration; the Puritans wrote for these reasons and also to defend and expound their theology and to train up the new generations in the ways of the old. For literary art in itself, or indeed for any art, they had little care, but when, as not infrequently happened, the men who wrote were interesting or great in their private or public capacities, they managed to impart some of their finer qualities to their writings, which may not exactly live, but are, at least, worthy of remembrance if not

of perusal by the reader interested in the history of his country.

The portion of this early literature produced by the southern and middle colonies is comparatively meagre. Captain Smith's works, which culminate in the composite *General History of Virginia, New England and the Summer Isles* (1624), are quaint and crude, but full of their adventurous and magniloquent author's energy. William Strachey's account of the famous wreck of Sir Thomas Gates (1610) may possibly, some think probably, have given Shakespeare hints for his description of the storm in *The Tempest*. Nothing so interesting was in all probability produced in Virginia until 1649, when a certain Colonel Norwood narrated to his relative, Sir William Berkeley, the adventures that had befallen him during and after his shipwreck. The same picturesque Governor Berkeley is one of the protagonists in the next Virginian tract of importance—the so-called *Burwell Papers*, descriptive of Bacon's Rebellion (1676). Only two interesting books are credited to Maryland during this century, John Hammond's *Leah and Rachel* (1656) and George Alsop's quaint *Character of the Province of Maryland* (1666). The Carolinas were settled too late to produce anything of consequence. The same thing is true of the Middle colonies, although Daniel Denton's *Brief Description of New York* (1670) is not uninteresting and Gabriel Thomas's *Account of Pennsylvania and New Jersey* (1698) does not lack sprightliness. Consult the books by W. P. Trent cited in the bibliography below.

An abundance rather than a lack of writings confronts the student of the seventeenth-century New England. The histories composed by Gov. William Bradford of Plymouth and Gov. John Winthrop of Massachusetts have many merits, but are on the whole fatiguing reading. The sermons and theological treatises of such representative divines as Thomas Hooker, Thomas Shepard, John Cotton, Peter Bulkeley, and their compeers furnish interesting passages for our anthologies, but are rarely read *in extenso*. The works of Roger Williams are probably treated in a similar fashion; but the loss falls upon the reader as well as upon the fame of that truly great man. Another writer who deserves more attention than he receives is Daniel Gookin, who wrote two books about the Christian Indians, for whom he labored in conjunction with that famous apostle, John Eliot. But unquestionably the most interesting book in prose produced in New England during the seventeenth century was Nathaniel Ward's *Simple Cobbler of Agawam* (1647), a whimsical compound of satire and invective that is almost without parallel. John Josselyn's *New England's Rarities Discovered* (1672) and his *Account of Two Voyages* (1674) deserve mention also as almost turning credulity into artistic virtue.

But the early New Englanders wrote verse as well as prose, especially verse of an elegaic nature. In 1640 appeared the astonishingly crude *Bay Psalm Book*. Ten years later Mrs. Anne Bradstreet's *Tenth Muse Lately Sprung up in America* was published in London, accompanied by poetical panegyrics that made the modest woman blush. Mrs. Bradstreet was not without genuine powers, as her later works showed; but she followed bad models, had no eye for the beauties of nature, and is in consequence al-

most unreadable to-day. This fate has not befallen Michael Wigglesworth's *Day of Doom* (1662), a New England Inferno which long continued to be popular. Its quaint stanzas are perused to-day with sensations quite different from those produced by them 200 years ago; but they are still read, and even quoted for amusement—a fortune not accorded to the amiable Wigglesworth's other performances. Wigglesworth is, however, almost a great poet when he is compared with contemporaries like Peter Folger, Franklin's grandfather, whose *Looking-Glass for the Times* (1677) is almost the *ne plus ultra* of doggerel. Perhaps the only poems of any decided merit composed in America during the seventeenth century are an anonymous epitaph on Bacon, given in the *Burwell Papers*, and an *Elegy on the Rev. Thomas Shepard* (1677), by the Rev. Uriah Oakes, President of Harvard.

The close of the seventeenth century in New England is marked for us by the famous persecutions for witchcraft which have given so sinister a reputation to many good men, especially to the two Mathers, Increase and Cotton. These are in some ways the most important divines of early New England, although they mark the decline of the theocracy rather than its culmination. Both were voluminous writers, and both treated in particular the two topics uppermost in the New England mind: to wit, the struggles of the saints against witches and fiends and against the savage Indians. All the dominant ideas of the times are found embodied in the younger Mather's encyclopædic *Magnalia Christi Americana* (1702), a chronicle which is not altogether authoritative as to facts, but is typical of its fantastic author and of the Brahmin caste he represented. Typical of the old order that was passing, and of the new that was coming in, is Judge Samuel Sewall's *Diary*, which ran from 1673 to 1729. Sewall is the Pepys of his time, and many a quaint page can be extracted from his jottings; but he should also be remembered as perhaps our first abolitionist, his short tract, *The Selling of Joseph*, dating from 1700. Another early diarist is Mrs. Sarah Kemble Knight, who wrote a sprightly account of a journey she took on horseback in 1704 from Boston to New York. Even in New England secular writing became more popular as the eighteenth century advanced, which is what one might expect, since the colonies were growing prosperous and were being affected by the utilitarian tendencies of the epoch. There is a considerable amount of verse, none of it of much consequence, and there is quite a mass of history, particularly of narratives dealing with Indian atrocities. Probably the most important poets are the Rev. Mather Byles and his contemporary, Joseph Green, but they succeeded best in trifles. The most scientific historian of the period is the Rev. Thomas Prince; the most interesting is the quaint Scotchman, William Douglas, whose *Summary* dates from 1747-51.

But theology did not vanish from New England with the weakening of the theocracy. The Rev. John Wise, with his *Churches' Quarrel Espoused* (1710) and his *Vindication of the Government of New England Churches* (1717) showed himself to be the peer of any of his forerunners and gave lessons in statesmanship to the revolutionary leaders who were to follow him. Greater than Wise was Jonathan Edwards, the most

original theologian and metaphysician that the New World has produced. In his juvenile papers Edwards anticipated Berkeley; in his personal memoranda and occasionally in his formal treatises he showed that he was a poet-mystic and a lover of nature rare for his times; in his *Narrative of Surprising Conversions* (1736) he displayed a remarkable psychological acumen. He is, of course, best known to-day by his *Freedom of the Will* (1754), which is still a powerful piece of exposition, although its conclusions seem monstrous and untenable, and by his minatory sermons, which, like the famous one preached at Enfield, Conn., held his awe-struck hearers suspended over the very mouth of hell. Edwards's theology is now antiquated, but his works contain the germs of nearly all subsequent theological speculations, and they are a well of inspiration to thoughtful readers. Consult Wendell and Greenough, *A History of Literature in America*.

The only American colonial who ranks with Edwards as a writer and thinker, Benjamin Franklin, while also a New Englander, is always regarded as a representative of the Middle colonies. Other interesting writers were grouped about him in Philadelphia, but New York and New Jersey produced few of any consequence. As a student of nature Franklin was only the foremost of an interesting group of men such as James Logan, John Bertram, and John Winthrop, of Harvard. As a writer and thinker on political subjects he exemplified the spirit of the age that was to produce publicists like John Dickinson, whose *Letters from a Farmer* (1767) focused the spirit of resistance; Samuel and John Adams, Jefferson, Hamilton, and Madison—men whose political writings, culminating in *The Federalist* (1788), astonished Europe and reached what perhaps is the high-water mark in this species of composition. For, as is well known, the eighteenth century was not less predominantly political than the seventeenth had been theological. It was also utilitarian, and so Franklin, who thoroughly summed up his age, was the creator of Poor Richard, whose *Almanac* may almost be said to be the foundation stone of popular education in America. It is probably his delightful *Autobiography*, however, that gives Franklin his position as the writer of the only literary classic produced in America before the nineteenth century. Taken along with his letters, this book, in both style and substance, furnishes us with one of the most remarkable self-revelations in literature. We read from a sense of duty a few authors of our Revolutionary period, like the satirists Francis Hopkinson and John Trumbull, author of *McFingal* (1775-82); we know *The Indian Burying Ground*, and a few other verses of the patriotic poet, Philip Freneau; we remember from our histories that the ill-fated Thomas Godfrey was the author of our first true poetical tragedy, *The Prince of Parthia* (1765); we smile at the mention of Joel Barlow's *Vision of Columbus* (1787), which developed into his formidable epic, *The Columbiad* (1807); but for many of us the true American literature of the eighteenth century is represented by the miscellaneous writings of Franklin.

This, however, is not altogether fair. Several of Franklin's contemporaries deserve to be remembered as writers of interest and of some importance. Among these are the Quaker John

Woolman; the loyalist historian of Massachusetts, Thomas Hutchinson; the patriotic historian and portentous dramatist and poet, Mrs. Mercy Otis Warren; the negro poetess, Phillis Wheatley, whose imitative verses astonished the learned of her day; the laborious poet, Rev. Timothy Dwight, whose *Conquest of Canaan* (1785), together with the productions of the so-called "Hartford Wits," was intended to lay the foundation of a real American literature and has at least been buried sufficiently deep for that purpose; the novelist, Mrs. Susanna Haswell Rowson, whose *Charlotte Temple* (1790) is still read—all these and a few other writers should be remembered before we accuse the eighteenth century in America of literary barrenness. These are not a tithe of the authors whom a serious literary historian would feel obliged to treat, and even we must add to them such a conscientious, if dull, historian as the Rev. William Stith, of Virginia, the distinctly more picturesque defender of the Old Dominion, Robert Beverley, and of the genial cavalier, Col. William Byrd, of Westover, whose *History of the Dividing Line* (1729) between Virginia and North Carolina is a remarkably entertaining production. To these Southern historians the name of Dr. David Ramsay, of South Carolina, should be added; but it is of more importance not to forget the greater works of two citizens by adoption—the Englishman, Thomas Paine, and the Frenchman, Hector St. Jean de Crèvecoeur. Paine's *Crisis* and his *Common Sense* (1776) did perhaps more to make independence the goal of the American Revolutionists than any other contemporary writings, and it was the spirit of the Revolution that animated his later but less acceptable books. Crèvecoeur's *Letters from an American Farmer* (1782) are full of an idealism more charming than can be found in Paine and of a love of nature almost worthy of Thoreau himself.

The confused period between the close of the Revolution and the beginning of the nineteenth century was naturally not propitious to literature. But many of the writers mentioned in the last paragraph did their best work in it, and to them we may add the names of Royall Tyler, whose play, entitled *The Contrast* (1786), was the first American comedy of importance; Noah Webster and Lindley Murray, famous later for their works in lexicography and grammar; Jeremy Belknap, author of one of the best of our early State histories, that of New Hampshire (1784); William Dunlap, whose *History of the American Stage* (1832) is still important, and Joseph Dennie, a writer of a mildly Addisonian type, whose *Portfolio*, founded in 1801, marked, with the contemporaneous establishment of the New York *Evening Post*, the great aid that journalism would give to literature throughout the new century.

But a more conspicuous writer than any of these, our first novelist, Charles Brockden Brown, had written his three most important novels, *Wieland*, *Ormond*, and *Arthur Mervyn* in the three closing years of the eighteenth century. He published three other novels in 1801, and his literary activity, which was mainly associated with Philadelphia, promised much for the new Republic. But his work was cut short by ill-health and an early death, and to modern readers his stories, while marked by distinct imaginative power, are too plainly connected with the extravagant school of God-

win and Mrs. Radcliffe to be attractive. Brown deserves, however, to be remembered as the first American who made the profession of letters a success, and he was a genuine predecessor of Hawthorne and Poe.

The opening decade of the nineteenth century was one of great political importance; but it is marked by few literary names of note, John Marshall's *Life of Washington* (1804) being less important than his judicial decisions, and the writings of the Rev. M. L. Weems and William Wirt not meaning much to the sophisticated readers of a century since. But in 1809 a work that will probably never lose its interest made it certain that American literature, in the true sense of the term, had been born. In this year Washington Irving gave the world "Diedrich Knickerbocker's" *History of New York*. Irving may be a little out of fashion to-day with some readers, and he may seem almost as much a British as an American classic; but a classic he is, whose style has perhaps not been surpassed, and whose essays, short stories and works of travel, biography, and history must be read by all cultivated Americans. During his long life he was the worthy head of the Knickerbocker school of writers who made New York the literary centre of the country before the rise of New England Transcendentalism.

It was more than a decade, however, after Irving's success before a really great writer arose to keep him company. Such poets as Washington Allston, John Pierpont, and Mrs. Sigourney, and such a dramatist as John Howard Payne, cannot send us back, with any great enthusiasm, to the second decade of the century just passed. It is true, nevertheless, that the founding of the *North American Review* at Boston in May, 1815, was an important event, and that, by publishing two years later the youthful Bryant's *Thanatopsis*, it introduced to the world a poet of dignity and power, who, if not precisely great, was at least able to interpret pleasingly and satisfactorily to Americans the natural beauties of their native land. Two other poets, inferior to Bryant, yet still remembered, Joseph Rodman Drake, author of *The Culprit Fay*, and Fitz-Greene Halleck, author of an elegy on Drake and some stirring lyrics, also made their appearance in this decade.

When James Fenimore Cooper published *Precaution*, in 1820, he gave the public no evidence that one of the greatest of modern writers of fiction had arisen. A competent reader of *The Spy*, which was issued the very next year, might, however, have perceived the fact. Two years later, *The Pilot* and *The Pioneer* showed that although Cooper might be essentially a follower of Scott, and although his style might be often slipshod and his power of characterization, especially in the case of women, almost nil, he was, nevertheless, master in his own splendid domain—the sea, the forest, and the prairie. The *Leatherstocking Tales* have been frequently called the real American epic, and a recognition of the truth of this statement would prevent many persons from underrating the genius of one of the few Americans who have won a world-wide fame by their writings. America has produced several authors of finer genius than Cooper possessed, but perhaps none of larger.

Besides Cooper the third decade of the last

century brought into notice the poet James Gates Percival, who unfortunately did not deserve the reputation he speedily acquired. A less highly praised poet, Edward Coate Pinkney, is now more interesting on account of his small but genuine lyric vein. The same decade counts among its worthies the indefatigable historiographer, Jared Sparks, and the admirable student of Spanish literature, George Ticknor. Lydia Maria Child, Edward Everett, the elder William Ellery Channing, and Bronson Alcott also made their appearance as writers; and Poe and Hawthorne published juvenile works that are now very rare. But perhaps the best-known production of the period is Webster's reply to Hayne, which struck the keynote that was to dominate our literature for the next generation and of which President Lincoln, in 1861, ordered a million copies to be printed and distributed.

The year 1831 saw the establishment of William Lloyd Garrison's *Liberator* and the publication of Whittier's first book, *Legends of New England*. Both men were to do a great work for the anti-slavery cause, and Whittier in especial was to endear himself to his native section as its true poet laureate. The writer who best represented New York at this period was Nathaniel Parker Willis, poet, traveler, and journalist. But he, though still interesting, has greatly declined in reputation. The same thing is true of those representative ante-bellum Southern writers, William Gilmore Simms, of South Carolina, and John Pendleton Kennedy, of Maryland, who, with Robert Montgomery Bird, of Pennsylvania, formed a group of romancers inferior indeed to Cooper, yet worthy of being read, at least in their best novels, such as *The Yemassee*, *Horse Shoe Robinson*, and *Nick of the Woods*. Besides these writers, who began their careers in the thirties, we should recall the historian George Bancroft, whose *History of the United States* remains eminently valuable, though dull and incomplete.

The Transcendental movement in New England, culminating in *The Dial* of the early forties, is, of course, the prime fact of American literary history before the Civil War. Yet many of the writers more or less connected with it, such as the critics George Ripley and Margaret Fuller, and the poets C. P. Cranch and Jones Very, have long since become mere names to most readers. The poet-naturalist, Thoreau, however, has not only held his own, but has gained ground year by year, and Emerson has taken his place with Hawthorne and Poe in the very front rank of American writers. Throughout his long life, Emerson was to his countrymen and to many Europeans not merely a great writer but an inspiring seer, and there are not wanting readers to-day who consider him, in his double capacity of philosopher and poet, the greatest of American men of letters. Since the publication of *The Scarlet Letter* (1850), this position has been assigned to Hawthorne by the majority of his countrymen, while foreign readers, especially in France, have unhesitatingly assigned it to Edgar Allan Poe, whose haunting poems and tales have seemingly exerted a greater literary influence than the works of any other American.

More influential, so far as the culture of the American people is concerned, has been the poetry of Henry Wadsworth Longfellow. It has been recognized by the critics that Longfel-

low's genius was at first overestimated; but critical depreciation has probably been carried too far, and it seems quite likely that the best loved of American poets will continue to rank not far below the greatest of his contemporaries. Much the same thing may be said of Oliver Wendell Holmes, whose *Autocrat of the Breakfast Table* (1858) has lost little or nothing of its popularity. As a poet also, Holmes, though he may most fairly be called the laureate of Boston, still has a hold upon the heart of the nation, and he should perhaps be better known as a novelist than he is; for his *Elsie Venner* (1861) is a striking book, though described by one of Holmes's friends as "a medicated novel."

James Russell Lowell by his *Fable for Critics* and the first series of *The Biglow Papers* (1848), had proved himself to be our greatest poetical humorist and satirist before the Civil War began. That cataclysm inspired him to write his great odes, and later he became easily the first of American critics and letter-writers, and one of the first of American publicists. He is too near us for a proper estimate to be made of his rank in our literature, but it would appear that his fame as humorist, essayist, and epistolary master is secure. Secure, too, seems the fame of those admirable historians William H. Prescott and John Lothrop Motley, although some of the former's works have suffered as technical history through the discoveries of modern investigators. Their junior, Francis Parkman, is, however, generally regarded as their superior, his great series of histories dealing with the struggle between French and English for the mastery of the New World being as fascinating and at the same time as scientifically thorough as any other historical compositions.

All the writers treated in the immediately foregoing paragraphs won at least a partial recognition before the Civil War. Their fame has not, however, entirely cast in the shade such writers as Richard Henry Dana, Jr., author of *Two Years Before the Mast* (1840), and Herman Melville, whose *Typee* (1846), *Omoo* (1847), and *Moby Dick* (1851), are among the best books of adventure in our literature. Nor is the work of Bayard Taylor, Donald G. Mitchell, Richard Grant White, James T. Fields, Thomas Wentworth Higginson, and Charles Eliot Norton, to be omitted even in so brief a sketch as the present. Mention should be made also of George William Curtis, E. P. Whipple, and the two Southern poets, Paul H. Hayne and Henry Timrod, as well as of the worthy Philadelphia dramatist and poet, George Henry Boker. Two other writers who emerged before the Civil War claim attention. One, Mrs. Harriet Beecher Stowe, stirred the sympathies of the civilized world by her pathetic story of American slavery, *Uncle Tom's Cabin* (1852); the other, Walt Whitman, by his *Leaves of Grass* (1855-83), poetically expressed the democratic ideal in a way that appealed profoundly to European readers; won him quite a large circle of devotees at home; and bids fair to secure for him a high place in American poetry.

The most noteworthy name in the decade to which the Civil War belongs is that of Samuel L. Clemens, who, over the pseudonym of "Mark Twain," won a world-wide reputation as a humorist and writer of fiction. Two other humorists who filled a large place in their day, whatever their future place may be, are Henry

W. Shaw (1818-85), better known as "Josh Billings"; and Charles Farrar Browne (1834-67) ("Artemus Ward"). With them appeared a number of authors whose later and more mature work has made them known throughout the country. One of the most important stories of the decade—important rather in its practical effect than by its literary value—was *The Man Without a Country* (1863), by Edward Everett Hale. Appearing at a time when the feelings of the nation were so divided, it did much to strengthen a spirit of loyalty to the Union. Two other writers, who first came to notice in the sixties, were cut off in what promised to be most fruitful careers—Theodore Winthrop, the novelist, whose *John Brent* (1862) was full of racy vigor, and Sidney Lanier, regarded by some critics as the most important American poet of the last 40 years.

Since 1870 the number of publications has been constantly and rapidly increasing, and two dominant types have appeared—the local short story and an exaggerated form of the romantic novel. As the Middle and Western States became more settled, a new type of literature arose, which was especially adapted to the new conditions. As early as 1868 a magazine, *The Overland Monthly*, had been established in San Francisco; and in it appeared the vivid, racy, unconventional story, *The Luck of Roaring Camp*, by Bret Harte. From the appearance of this tale may be dated the vogue of the short story dealing with the local conditions in various sections of the United States. Following Bret Harte, many writers appeared all over the country, each depicting the life and manners of his own particular section. For the most part, they emphasized local conditions by employing the dialect peculiar to their division of the country. Among the more successful of these dialect writers were Joel Chandler Harris, with his *Uncle Remus* stories; Edward Eggleston, the author of *The Hoosier Schoolmaster* (1871), and other tales of the Middle West; G. W. Cable, who so skillfully depicted the French Creole life of New Orleans; and Mary Noailles Murfree, better known under her pseudonym "Charles Egbert Craddock," whose novels of the mountain whites of Tennessee, Kentucky, North Carolina, and Georgia first attracted the attention of the country to these peculiar people. But although the majority of short-story writers used dialect forms, there were a number who generally adhered to more conventional styles of expression, depending upon their power of characterization and the enumeration of salient details to give the necessary semblance of reality. Among these were Harold Frederic, who dealt with the crude life of west-central New York, producing at least one notable book (1896) in *The Damnation of Theron Ware* (republished in England under the title *Illumination*); Hamlin Garland, who wrote of the Northwest; Thomas Nelson Page, who made his own the landed gentry of Old Virginia; James Lane Allen, who depicted the people of Kentucky; and Mary E. Wilkins, who with deserved success wrote her vignettes of the narrower life of New England. F. R. Stockton drew with much quaint humor some familiar and very characteristic American types in *Rudder Grange*; and Ernest Thompson Seton described the lives of wild animals by the original and interesting method of looking at their environment from their own assumed standpoint.

Besides these writers there were a few successful authors whose works cannot be classified under any one division. First of these is Gen. Lew Wallace, whose *Ben Hur* (1880), a tale of the early days of Christianity, was immensely popular. It was a forerunner of the reaction against the short dialect story; for just as the psychological novel had given place to the story, so it in turn was to be superseded by the unalloyed romance. A prolific and interesting writer was Francis Marion Crawford, who was an exponent of the theory that a novel should be essentially a drama, in which descriptions should take the place of scenery, a notion admirably carried out in his most powerful work, *Greifenstein*. At the same time William Dean Howells and Henry James were working along lines parallel yet clearly separated. The former practically created the novel of American social life with men and women rather than incidents for material; and in his stories commonplace occurrences charm through his skillful realization of the characters. Mr. Howells in his many novels of American life has done for our country what Balzac did for France in his *Comédie Humaine*. Moreover, in such books as *The Rise of Silas Lapham*, he has caught and fixed with remarkable success the characteristics of an era that will soon be known only by these works of genius. Henry James has been characterized as the "creator of the international novel." His psychology is admirable though almost too subtle and his style is refined to a degree. Mrs. Wharton, first noticed as a follower of Henry James, shows in her later works but little of his influence. *The Valley of Decision* (1903), a story of Italy in the eighteenth century, attracted notice. *The House of Mirth* (1905), a story of "society" life in New York, was considered at the time the finest American novel recently written. Gertrude Atherton in her best writing reveals the days of Spanish California, and in *Senator North* there is a very striking study of an individual who has an admixture of black blood.

In 1894 *The Prisoner of Zenda*, by an English author, Anthony Hope Hawkins, being well received by a public tired of psychology and dialect, and eager for tales of adventure, in welcome contrast with the commonplace civilization of the day, made the romantic novel popular. Winston Churchill, Mary Johnston, Bertha Runkle, Charles Major, Maurice Thompson, S. Weir Mitchell, Paul Leicester Ford, and many others wrote historical romances, of which hundreds of thousands of copies were sold within very short periods. The beginning of the twentieth century was marked by the introduction of the novel dealing with the individual who is in revolt against existing social conditions. Although this perhaps is not yet a clearly defined department of fiction, *Unleavened Bread* (1900), by Robert Grant, *A Singular Life* (1895), by Elizabeth Stuart Phelps, and *A Gentleman from Indiana* (1900), by Booth Tarkington are all novels which show the same general tendency to emphasize individualism.

At present skillful craftsmen in fiction multiply, and a group of recent cultivators of the field may be mentioned. Margaret Deland (1857—), through her "Old Chester" stories, has a niche of her own among our twentieth-century story-tellers. For the light clever fiction of Richard Harding Davis (1864—) and Robert W. Chambers (1865—) the public has shown a

prodigious liking. Kate Douglas Wiggin (Mrs. George C. Riggs) (1857—) has won and held a large audience with stories of California, New England, and old England. Gertrude Atherton (1857—), a stronger novelist, but of uneven quality, writes indifferently of East and West, or of life abroad, and in *The Conqueror* produced an impressive historical novel. A novelist—primarily of American history—whose work improves in successive books, is Winston Churchill (1871—); his *The Crisis* is of the best of Civil War stories. A Southern novelist of manners of the days during and since the War is Ellen Glasgow. Another Southern novelist is Mary Johnston (1870—), who brings together war time incidents of fact and fiction with striking panoramic effect. David Graham Phillips (1867–1911) stands out from the company of mere clever writers by his rude force, his definiteness of social and moral aim, and his vocal Americanism. As purely American as Phillips, is Robert Herrick (1868—), with his novels depicting, particularly, the Middle West. The ranch and the mines of the far West are the themes of the unmistakably indigenous work of Owen Wister (1860—). In 1910 America lost by the death of Sydney Porter, "O. Henry," a short-story writer of extraordinary variety and ingenuity, and perhaps the most popular practitioner of the *genre* in this country. Frank Norris's novels, written between 1897 and 1902, notably *The Pit*, are sensational but strong; and *The Call of the Wild*, *The Sea Wolf*, and other tales of life in Alaska, the Yukon, etc., by Jack London (1876—) are stirring and adventurous.

Humor of a distinctively national stamp has been a pretty constant property of American literature from Benjamin Franklin to Mark Twain and beyond. Most of our greater writers—Irving, Lowell, Holmes, and Bret Harte among them—were humorists incidentally, not primarily; but there is a group of men who were humorists first and last. To this group belong, in addition to Mark Twain, Josh Billings, and Artemus Ward, mentioned all of them above, Edgar Wilson Nye (1850–96), "Bill Nye"; George Ade (1866—); and Finley Peter Dunne (1867—), "Mr. Dooley." Bill Nye and George Ade descend too often in their extravagant horseplay to the level of the newspaper comic supplement. Mr. Dooley is easily the first of our present-day humorists, and in his inimitable Irish-American idiom has satirized the foibles and idols of the hour in a running fire of racy and brilliant papers that mayhap will survive both.

In turning to poetry one is struck with the dearth of really important names. Among any number of versifiers, musical but commonplace, E. C. Stedman, R. H. Stoddard, T. B. Aldrich, Richard Watson Gilder, H. C. Bunner, and Richard Hovey are amongst those whose poetry has risen above the ordinary level. An exception is to be made in the case of W. D. Howells's *Stops of Various Quills*, a book now little read, but for technique and deep feeling worth the whole body of other contemporary American verse. Others of the older singers are still heard, among them James Whitcomb Riley (1853—), while Cincinnati Heine Miller (1841–1913), "Joaquin Miller," has recently sung his last song. William Vaughn Moody (1869–1910), perhaps more the poet than any other American of his generation, leaves behind him his friend, Edward Arlington Robinson (1869—),

who may be characterized in like terms. The work of Madison Cawein (1865—) should have honorable mention, as also that of Ridgely Torrence (1875—), Louis Vernon Ledoux (1880—), Emily Dickinson, Josephine Preston Peabody, and Percy Mackaye (1875—).

In historical composition there has been a marked inclination to follow the example set by the English historian, J. R. Green, and not only to weigh carefully the dramatic events of political history, but also to study with equal thoroughness the character of the people themselves. This tendency has been especially evident in the works of John Fiske, John Bach McMaster, Woodrow Wilson, and Edward Eggleston, all of whom have added much to our knowledge of conditions and men at the beginnings of our national life, and in the elaborate researches of Justin Winsor. Another historical writer of great importance is James Ford Rhodes, the historian of the Civil War and the period of Reconstruction, whose work, beginning with the Compromise of 1850, is the most richly documented American history that has yet been produced. Mention should also be made of William M. Sloane, the author of a monumental biography of Napoleon, now superseded by the English biography of J. H. Rose; William A. Dunning with his minute researches in the history of the Civil War; Woodrow Wilson, whose *History of the United States* is one of the few that cover the whole period of our national existence; H. W. Elson, whose book is equally comprehensive and still more popular; while Harry Thurston Peck in his *Twenty Years of the Republic* (1885–1905) attempted, not unsuccessfully, the difficult task of writing a contemporaneous history with impartiality and lucidity.

Literary criticism has had many representatives; but since James Russell Lowell's death American literature has found no one fitted to succeed him. The best-known critics who enjoyed a certain amount of authority in late years were William Dean Howells, Henry James, Brander Matthews, George E. Woodberry, Harry Thurston Peck, William C. Brownell, Norman Hapgood, James Huneker, F. M. Colby, and Paul Elmer More. In recent criticism, however, there is a note of individual preference at times almost emotional, and an absence of definite æsthetic standards, such as those which characterized the work of Sainte-Beuve and Brunetière in France and of Matthew Arnold and Courthope, in England. Consult H. H. Boyesen, "American Literary Criticism," in his *Silhouettes* (1894); and the article CRITICISM.

In conclusion, the most important developments since 1870 are New England's loss of literary supremacy; the wide distribution of literary activity; the decline of the essay as a recognized medium of purely literary expression; the predominance of light fiction, and an unparalleled increase in the number of books, newspapers, magazines, and other periodicals. In the early twentieth century the serious book has largely yielded to the magazine, and the magazine to the "literary supplement" of the newspaper; just as the legitimate drama had been supplanted successively by the light comedy, the vaudeville, and the moving-picture show. Many take a pessimistic view of American literary tendencies, but it is likely that the great increase in the number of those who read something will end in a greater demand for serious

literature, as discrimination is developed by comparison and criticism.

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AMERICAN MERCHANT MARINE. See UNITED STATES. *Shipping*; SHIPPING SUBSIDIES.

AMERICAN MUSE'UM OF NAT'URAL HIS'TORY. See MUSEUM.

AMERICAN NOTES. By Charles Dickens, published in 1842, after his first visit to the United States. They excited resentment in America.

AMERICAN PAR'TY. This party is generally considered as being the same as the Know-Nothings. The terms were not synonymous at first, but later came to be. (See KNOW-NOTHINGS.) The American Party was an expansion of the Know-Nothings into a national political organization. It came into existence soon after the election of 1852, which witnessed the end of the Whigs. The increasing agitation against slavery and the opposition to the Fugitive Slave Law were bound to produce a new party to oppose the Democrats. This party was the result. Its cardinal principles were opposition to foreigners and to the Roman Catholic church. The only national election in which it played an important part was that of 1856. Its candidates were Fillmore and Donelson, and they polled nearly a million votes. See Woodburn, *American Politics* (New York, 1903); Stanwood, *History of the Presidency* (Boston, 1898).

AMERICAN PEACE SOCIETY. See PEACE MOVEMENT, INTERNATIONAL.

AMERICAN RIV'ER. A river in north central California (Map: California, C 2). It rises in Eldorado County and flows southwesterly toward the Sacramento River, into which it empties a little above the city of Sacramento. Gold has been frequently found along its banks.

AMERICAN SYC'AMORE. See PLANE.

AMERICAN SYS'TEM. See TARIFF.

AMERICAN U'NIVER'SITY. An institution of higher learning under the auspices of the Methodist Episcopal Church, situated at Washington, D. C., chartered in 1893. Its plans include the College for Graduate Study, providing (1) an institute for research, (2) courses of lectures, and (3) a system of fellowships. A Board of Award, consisting of seven, supervises its academic work and nominates to the fellowships. The plan of organization provided that for entrance to all courses the bachelor's degree, or its equivalent in scholarship, should be required. The assets in 1913 amounted to \$3,000,000. Chancellor, 1913, Franklin Hamilton, Ph.D.

AMERICAN WINE. See WINE.

AMERICA'S CUP. See YACHT.

AMERICUS. A city and the county-seat of Sunter Co., Ga., 71 miles by rail southwest of Macon, at the junction of the Central of Georgia and the Seaboard Air Line railroads (Map: Georgia, B 3). It is in an agricultural region, producing cotton, corn, watermelons, pecans, and peaches. The chief industries of the city include cotton oil, fertilizer, metal and monument works. Americus is the seat of a State agricultural college, and has a fine Y. M. C. A. building, a Carnegie library, and a palatial hotel. Eleven miles north of the city lies historic Andersonville (q.v.). Settled in 1832, Americus was incorporated in 1855. It is governed by a charter of 1889, which places the mayor's term at two years, and provides for a city council of six members elected on a general ticket, with full power of appointment. The city owns and operates its water works. Pop., 1900, 7674; 1910, 8063; 1913 (est.), 11,000.

AMERIGHI, ä'mâ-rê'gê, MICHELANGELO. See CARAVAGGIO.

AMERIGO VESPUCCI, ä'mâ-rê'gö vës-pööt'-chê. See VESPUCIUS, AMERICUS.

AM'ERIND. A name suggested as a designation for the American Indians (including the Eskimo and the Fuegians), as distinguished from the natives of India and the adjacent regions. It is compounded from the two words, *American* and *Indian*, and originated with Major J. W. Powell, Director of the Bureau of American Ethnology, and an American lexicographer. See article AMERIND in *Handbook of Amer. Inds. N. of Mexico*, Pt. I (Washington, 1907), p. 49.

AMERLING, ä'mêr-ling, FRIEDRICH VON (1803-87). An Austrian portrait and figure painter. He was born at Vienna and studied at the academy there. He then worked with Sir Thomas Lawrence in London and with Horace Vernet and also studied in Italy (1831), where he was influenced by Venetian color. On his return to Vienna his portrait of the Archduke Rudolph of Austria (1832) won the favor of Emperor Francis I, who ordered a portrait of himself enthroned in the royal regalia (1833). He painted several other portraits of the Emperor and became in consequence the principal portrait painter of the Viennese aristocracy. The years 1841-44 were spent chiefly in Florence and Rome, where he began to paint single figure subjects with great success. Of his portraits, which number about 1000, are those of Prince Schwarzenberg, Princess Khevenhüller, the sculptor Thorwaldsen, the poet Grillparzer, Prince Liechtenstein, and several of the artist himself. His figure subjects include a "Lute Player," the painter's brother as a "Fisher Boy," and the "Apostle Paul" (the last two in the Imperial Gallery, Vienna), and "The Greek Girl." His

portraits are rich in color and the well-characterized sitters are elegant in bearing; but the pose, especially of the woman, is often affected and theatrical. Consult the painter's *Life* by his friend Frankl (Vienna, 1889); Pollak, *Oesterreichische Künstler* (Vienna, 1905).

AMERSFOORT, ä'mērz-fōrt. An ancient town in the province of Utrecht, Netherlands, 15 miles by rail northeast of Utrecht on the Eem, which flows into the Zuider Zee (Map: Netherlands, D 2). The town is situated in a fertile plain at the foot of sandy hills. Tobacco is much grown in the district, and cotton and woolen goods, leather, soap, glass, beer, etc., are manufactured. The Catholic church of St. Mary, built in the fourteenth century, was partly destroyed by an explosion in 1787, but its Gothic tower was not injured. This tower is 312 feet high, has excellent chimes, and is considered the finest in Holland. There is also a fine museum, and a college of Jansenists. Pop., 1890, 15,500; 1900, 19,089; 1911, 23,997.

AMERY, ā'mēr-i, LEOPOLD CHARLES MAURICE STENNETT (1873—). An English historian and publicist, born at Gorakpur, India, and educated at Harrow and at Balliol College, Oxford. He traveled in the Near East in 1897-98, after being elected a fellow of All Souls College, Oxford, and in 1899 joined the staff of the *London Times*. For this paper, at the outbreak of the Boer War, he organized the staff correspondence in South Africa. He contested seats in Parliament in 1906, 1908, and 1910, and in 1911 was elected from South Birmingham as a Unionist. In addition to the monumental *Times History of the War in South Africa*, which fills seven volumes and is considered an exhaustive and definitive treatment of the war, he wrote *The Problem of the Army* (1903); *Fundamental Fallacies of Free Trade* (1906); *The Great Question* (1909); *The Case against Home Rule* (1912); *Union and Strength* (1912).

AMES, ānz. A city in Story Co., Iowa, 37 miles north of Des Moines, on the Chicago and Northwestern Railroad (Map: Iowa, D 3). It is the seat of the State College of Agriculture and Mechanic Arts (founded in 1869), which has an enrollment of over 2500 students and occupies a plant covering more than 1000 acres. Ames possesses a Carnegie library and owns and operates its water works and electric light plant. Its chief industry is the manufacture of banners and pennants. The Lincoln Highway passes through the city. Pop., 1890, 1276; 1900, 2422; 1905, 3292; 1910, 4223; 1913 (est.), 5000.

AMES, ADELBERT (1835—). An American soldier. He was born at Rockland, Me., and graduated at West Point in 1861. He was wounded at the first battle of Bull Run and afterward served with distinction at Malvern Hill, Antietam, Fredericksburg, Chancellorsville, Gettysburg, and Petersburg. He was brevetted (March 13, 1865) major-general of volunteers for conduct at Fort Fisher, and on July 28, 1866, became a lieutenant-colonel in the regular army. He was afterward Provisional Governor of Mississippi from 1868 to 1869, and was Commandant of the Fourth Military District (including Mississippi) from 1869 to 1870, and was a United States Senator from 1870 to 1873, when he became Governor of Mississippi by popular election. His administration of affairs soon antagonized the whites, who accused him of favoritism to the negro population, and a bitter race war ensued, culminating in the

Vicksburg riot of Dec. 7, 1874, and in numerous minor conflicts between Democrats and Republicans. Finally, in 1876, the Democrats having secured a majority in the Legislature, Ames was impeached, and resigned on condition that the charges against him be withdrawn. (See MISSISSIPPI.) He then removed to New York, and, later, to Lowell, Mass., and during the Spanish-American War served as brigadier-general of volunteers.

AMES, FISHER (1758-1808). An American orator and Congressman. He was born at Dedham, Mass., April 9, 1758. He graduated at Harvard in 1774, began the practice of law in 1781, and soon became favorably known through his trenchant newspaper articles in condemnation of Shays's Rebellion (q.v.) and in favor of a strong government. This local reputation was increased by his efforts in favor of the Federal constitution in the Massachusetts Convention of 1788, the immediate result of which was his election to Congress, where he served for eight years, becoming known especially as an accomplished public speaker. In his later years he served in the Massachusetts Council, delivered a eulogy on Washington before the Legislature, and produced a number of essays; but he took no part in active politics. In 1804 he declined the presidency of Harvard. He died July 4, 1808. A single volume of his *Works* was published in Boston (1809), and later his son, Seth Ames, edited his writings and speeches in more extended form, with a memoir by J. T. Kirkland (Boston, 1854).

AMES, HERMAN VANDENBURG (1865—). An American scholar and educator, born in Lancaster, Mass. Having graduated from Amherst College in 1888, he took advanced courses at Columbia and Harvard universities, receiving the degree of Ph.D. from Harvard in 1891. After teaching for three years in the University of Michigan, he went abroad for further post-graduate work at Leipzig and Heidelberg. He became assistant professor of history in Ohio State University (1896), and, in the University of Pennsylvania, successively instructor in American constitutional history (1897), assistant professor of American history (1903), and professor of American constitutional history (1908). Professor Ames was also made dean of the Graduate School at Pennsylvania in 1907. Besides his other activities, he lectured at summer sessions of Columbia and the University of Wisconsin and became member and officer of many historical societies. In addition to contributing frequently to periodicals and editing *State Documents on Federal Relations*, *The States and the United States* (1906), he wrote: *The Proposed Amendments to the Constitution of the United States*, which received a prize of the American Historical Association (1897); *Outline of Lectures on American Political and Institutional History during the Colonial and Revolutionary Periods* (3d ed., 1908); *Syllabus of American Colonial History* (with W. T. Root, 1912).

AMES, JAMES BARR (1846-1910). An eminent American educator and legal scholar. He was born in Boston, graduated in 1868 at Harvard and in 1872 at the Law School of the University, in 1868-69 was an instructor in a private school at Boston, and from 1871 to 1872 was tutor in German and French at Harvard. In the same institution he was appointed successively instructor in history (1872), asso-

ciate professor of law (1873), and professor of law (1877). In 1895 he became dean of the Harvard Law School. He published various articles in the *Harvard Law Review* and similar periodicals and compiled and edited numerous valuable collections of cases on torts, trusts, and suretyship, and other legal questions. A man of profound but unaffected scholarship and a teacher of rare power and distinction, he exerted a wide and lasting influence on the development of the law of this country. His scattered essays on legal topics were collected and published after his death as a memorial to his genius, under the title *Essays in Legal History* (Boston, 1912). It is not too much to say that they constitute the most important contribution to legal scholarship that has yet been made in America. He received the degree of LL.D. from New York University (1898), the University of Wisconsin (1898), and the University of Pennsylvania (1899).

AMES, JOSEPH (1689–1759). An English antiquary and bibliographer, born at Yarmouth. He was in some sort of mercantile pursuit, and in addition to various other compilations published the *Typographical Antiquities* (1749), regarded as forming the foundation of English bibliography.

AMES, JOSEPH ALEXANDER (1816–72). An American portrait painter. He was born in Roxbury, N. H., and was a pupil of Washington Allston in Boston. Of varied talents, he painted figure, genre and landscape, but his portraits are his best work. In 1848 he went to Rome, where he painted a picture of Pope Pius IX. On his return to America he lived successively at Boston, Baltimore, and New York, where he was elected a member of the National Academy of Design in 1870. His best portraits are those of Emerson, Rachel, Ristori, Clarence A. Seward, Webster, Choate, and President Felton of Harvard; his figure subjects, "Miranda" and the "Death of Webster."

AMES, JOSEPH SWEETMAN (1864—). An American physicist and educator, born at Manchester, Vt. He graduated in 1886 at the Johns Hopkins University; became professor of physics there (1899), and director of the physical laboratory (1901). Professor Ames was elected an honorary member of the Royal Institution of Great Britain. He became assistant editor of the *Astro-Physical Journal* and associate editor of the *American Journal of Science*; editor-in-chief of the *Scientific Memoir Series*; editor of J. von Fraunhofer's memoirs on *Prismatic and Diffractive Spectra* (1898); author of *The Theory of Physics* (1897), *Elements of Physics* (1900), *The Induction of Electric Currents* (2 vols., 1900), *Text-Book of General Physics* (1904).

AMES, MARY CLEMMER (Mrs. EDMUND HUDSON) (1839–84). An American author, best known by her "Woman's Letter from Washington," contributed for many years to the *New York Independent*. She was born at Utica, N. Y., and at an early age married the Rev. Daniel Ames, from whom she was divorced in 1874. Her early newspaper experience was gained on the *Springfield Republican*, the *New York Press* (1865), and the *Brooklyn Daily Union* (1869–71). In 1871 she received \$5000 for her work, the largest salary ever paid a newspaper woman up to that time. In later life she removed to Washington, where her home was a literary and social centre, and in 1883 she married Edmund Hudson, editor of the

Army and Navy Register. Her works include *Victoria* (1864) and *Eirene* (1870), novels; *Ten Years in Washington* (1871); *Memorials of Alice and Phœbe Cary* (26th ed., 1885), of whom she had been an intimate friend; a volume of poems (1872); *Outlines of Men, Women, and Things* (1873); *His Two Wives* (1874); and *Poems of Life and Nature* (3d ed., 1886). Her complete works were published at Boston (4 vols., 1885). Consult Hudson, *Memorial Biography of Mary C. Ames* (Boston, 1886).

AMES, NATHAN P. (1803–47). An American manufacturer of firearms, ordnance, and cutlery. In early life he owned extensive cutlery works at Chicopee Falls, Mass., but afterward removed to Cabotville (now Chicopee). The works were supplemented in 1836 by a bronze foundry, where most of the brass guns for the United States army were cast. There also the statues of DeWitt Clinton, in Greenwood Cemetery, Brooklyn; of Washington, in Union Square, New York; and of Franklin, in School Street, Boston, were cast.

AMES, OAKES (1804–73). An American manufacturer and legislator. He was born at Easton, Mass., and at an early age entered his father's workshop, where he soon familiarized himself with every detail of the shovel business, which, upon the discovery of gold in California and the impetus thereby given to railroad building, soon became a most important industry. He served in the cabinet of the Governor of Massachusetts in 1860. Four years later, after others had failed, he was called upon by President Lincoln and others to build the Union Pacific Railroad, which great undertaking he successfully completed on May 10, 1869. He had invested \$1,000,000 in the enterprise and had pledged the remainder of his fortune for the same purpose. He was censured by the Forty-second Congress for participation in the Credit Mobilier (q.v.), but afterward was vindicated in a resolution passed by the Massachusetts Legislature (May 10, 1883). From 1862 to 1873 he represented the second Massachusetts district in Congress. He bequeathed \$50,000 to children of North Easton, Mass. A fine monument in his memory was erected by the Union Pacific Railroad at Sherman, Wyoming, the highest point reached by the railroad. Consult *Oakes Ames: A Memoir* (Cambridge, 1884).

AMES, OLIVER, LL.D. (1831–95). The thirty-first Governor of Massachusetts, a son of Oakes Ames. He was trained in his father's manufactory and upon his death undertook the discharge of the numerous financial obligations incurred by the building of the Union Pacific Railroad and other enterprises, paying within a few years debts aggregating millions of dollars. In 1882, after being a member of the State Senate for two years, he was chosen Lieutenant-Governor of Massachusetts, serving for four successive terms, and in 1886 was elected Governor, to which office he was reelected in 1887 and 1888.

AMES, WILLIAM (1576–1633). An English Puritan clergyman and writer on moral philosophy, born in the county of Norfolk and educated at Christ College, Cambridge. He was compelled to leave England because of persecution for nonconformity, and then became professor of theology in the University of Franeker, Friesland, from 1622 to 1632. He was famous in his time as a master of theological controversy and is considered to have had a great influence

on the religious thought of Europe. His best-known work is *De Conscientia, eius Iure et Casibus* (1632).

AMES, WINTHROP (1871—). An American theatrical manager, born at North Easton, Mass. After he graduated from Harvard in 1895 and had spent an additional year of special study at the university, he was engaged in editorial and publishing work in the general field of art and architecture for some eight years. His chief interest, however, lying in the theatre and its management, he undertook, in 1904, the direction of the Castle Square Theatre in Boston, a house devoted especially to producing good plays at popular prices. Mr. Ames's Boston success induced the founders of the New Theatre in New York City to select him (1908) as director of their ambitious enterprise. While artistically successful, his management of this theatre was, from a variety of reasons, so unprofitable financially that the project had to be abandoned in 1911. (See **DRAMA**.) Mr. Ames built, in 1912, a small but elegant playhouse which he called The Little Theatre, there presenting some of the most notable dramatic productions seen in New York City in a number of years. He also built the Booth Theatre (1913).

AMESBURY, āmz'bēr-ī. A town in Essex Co., Mass., on the Boston and Maine Railroad, 42 miles northeast of Boston (Map: Massachusetts, F 2). It has a public library, operates its own water works, and manufactures carriages, electric automobiles, automobile fittings, hats, reed and rattan goods, mirrors and reflectors, motor boats and dories, brass castings, shoes, and hinges. The government is administered by town meetings, held annually. Originally a part of Salisbury, Amesbury was virtually separated as New Salisbury in 1654 and was incorporated in 1666 and named (from Amesbury, England) in 1667. There is here a monument erected to Josiah Bartlett, who was born in Amesbury. John Greenleaf Whittier lived here from 1836 until his death in 1892. Pop., 1890, 9798; 1900, 9473; 1910, 9894. Consult J. Merrill, *History of Amesbury* (Haverhill, 1880).

AM'ETHYST (Gk. ἀμέθυστος, *amethystos*, a remedy against drunkenness, from ἀ, *a*, priv. + μέθυ, *methy*, wine). A violet blue or bluish-violet variety of quartz, the color of which is believed to be due to manganese oxide. It is one of the most widely used of the semi-precious stones, rings, pendants, necklaces, and other articles of jewelry. The ancients imagined it to possess the property of preventing drunkenness, and some of those addicted to that habit wore it on their persons. Amethyst frequently occurs lining the interior of balls or geodes of agate and in veins and cavities in various rocks. The finest specimens are from Scotland, Siberia, India and Ceylon. In the United States the amethyst is found in many localities, but seldom of sufficient clearness or color to be used as a gem. The Lake Superior crystals, from the slaty formations around Thunder Bay, are perhaps the best known, and annually thousands of dollars' worth is sent from this locality to be sold at Niagara Falls and other tourist resorts. The Oriental amethyst is a purple variety of corundum.

AM'ETRO'PIA (Gk. ἀ, *a*, priv. + μέτρον, *metron*, measure, or ἀμέτρος, *ametros*, disproportionate + ὤψ, *ōps*, eye). Any departure from the normal refractive condition of the eye or emme-

tropia. In emmetropia, in the absence of accommodative effort, i.e., when the eye is at rest, parallel rays of light are focused on the retina. In ametropia the retina may lie behind the principal focus of parallel rays, in which case the eye is said to be myopic; or in front of this focus, when it is called hyperopic. In the one case the eyeball is too long, in the other too short. See **HYPEROPIA**; **MYOPIA**; **ASTIGMATISM**; **VISION**.

AMGA, ām-gä'. A river in the territory of Yakutsk, Siberia, rising in the Aldan Mountains, flowing toward the northeast, and joining the Aldan, a tributary of the Lena (Map: Asia, N 2).

AMHARA, ām-hä'rá (the high lands). The central division of Abyssinia, occupying the territory around Lake Tsana (Map: Africa, H 3). The capital is Gondar. See **AMHARIC LANGUAGE**.

AMHARIC (ām-hä'rik) **LAN'GUAGE**. A modern Semitic dialect which derives its name from the people of Amhara (q.v.), one of the divisions of Abyssinia. Next to the Arabic, Amharic is the most widely spread of the Semitic languages. It has displaced in popular usage the original language of Abyssinia, the Ethiopic or Geez, and is now the spoken tongue, whereas the Geez is only used in the liturgy. For many years Amharic had no writing, so that it changed very much in its forms, conjugations, and even in the meanings of its roots. Moreover, its vocabulary received non-Semitic additions from the surrounding African tribes. Hence it is that Amharic is the least Semitic of the Semitic languages, and this appears very strongly in the syntax. When the Amharic language began to be written, the Ethiopic or Geez letters were used. A literature has grown up in comparatively modern times. Its oldest documents are some war songs from the fifteenth and sixteenth centuries, published by Guidi, *Le canzoni geez-amarina in onore di Rè-Abissini* (1889); *Documenti amarina* (1891). With the seventeenth century begins the creation of a purely Amharic literature, partly under the influence of European missionaries. The translation of the Bible was made by missionaries. Of grammars there are those of Ludolph (Frankfort, 1698); Isenberg (London, 1842); Massaja (Paris, 1867); Prätorius (Halle, 1879); Guidi (Rome, 2d ed., 1892); Mondon-Vidailhet (1898); Apevork (1905); Mahler (1905); of dictionaries, Isenberg's (London, 1841); A. d'Abbadie's (1881). See **AFRICAN LANGUAGES**.

AM'HERST. A district of Lower Burma (q.v.), British India.

AMHERST. A town in Hampshire Co., Mass., 16 miles north of Springfield, on the Boston and Maine and Central Vermont railroads (Map: Massachusetts, C 3). The scenery is picturesque, with beautiful views of the Connecticut valley, Mount Holyoke, and other mountains. It is the seat of Amherst College and of the Massachusetts Agricultural College (qq.v.). Straw hat manufacture is the principal industry. Probably settled as early as 1703, Amherst was part of Hadley and was known successively as New Swamp, Hadley Farms, East Farms, and East Hadley until, in 1759, it was incorporated as a district under its present name, given by Governor Pownall in honor of Gen. Jeffrey Amherst (q.v.). In 1776 it became a town. The government is administered by town meetings. Amherst is rich in Revolutionary tradition. Pop., 1890, 4512; 1900, 5028; 1910, 5112; 1913

(est.), 5308. Consult Carpenter and Morehouse, *The History of the Town of Amherst* (Amherst, 1896); Walker, *Historic Homes of Amherst* (Amherst, 1905).

AMHERST, formerly FORT LAWRENCE. A port of entry and the chief town of Cumberland Co., Nova Scotia, Canada, near the head of Cumberland Basin, and on the Inter-Colonial Railway (Map: Nova Scotia, E 3). It is 138 miles by rail north by west of Halifax, and has car shops, woolen mills, boot and shoe factories, iron foundries, engine and boiler works, tanneries, trunk factories, etc. An important trade in lumber and coal is carried on. Pop., 1901, 4964; 1911, 8973; 1913 (local est.), 10,320.

AMHERST, JEFFREY, BARON (1717-97). An English soldier. He was born at Riverhead, Kent, and for some time was a page in the household of the Duke of Dorset. He entered the army as ensign in 1731, soon became an aid-de-camp of General Ligonier, and in the War of the Austrian Succession served at Dettingen, Fontenoy, and Roncoux, and in the Seven Years' War at Hastenbeck. In 1758 Pitt raised him from the rank of Lieutenant-Colonel to that of Major-General, and put him in command of the expedition against Louisburg, which, after a short siege, surrendered on July 27. In September he replaced Abercromby as Commander-in-Chief of the English forces in America and in 1759 led the expedition against Ticonderoga and Crown Point, gaining possession of the former July 23 and of the latter August 1. In the following year he commanded in person the forces before Montreal and on September 8 compelled the French to capitulate and surrender Canada with all its dependencies to the British crown. For his services he was appointed Governor-General of British North America, was formally thanked by Parliament, and was made a Knight of the Bath. Having no knowledge of Indian warfare and scorning to avail himself of the undisciplined colonial militia, he proved unfit for the task of suppressing the conspiracy of Pontiac (q.v.) and returned to England in 1763, where, as the conqueror of Canada, he was received with the greatest enthusiasm. He was absentee Governor of Virginia from 1763 to 1768, was appointed Governor of Guernsey in 1770, and became a Privy Councilor in 1772. From 1772 to 1782 and from 1783 to 1793 he was acting Commander-in-Chief of the British Army. He became a General in 1778, was Commander-in-Chief 1793 to 1795, and was made a Field-Marshal in 1796. For his record as an officer in America, consult Parkman, *Montcalm and Wolfe* (Boston, 1884), and *The Conspiracy of Pontiac* (Boston, 1851).

AMHERST, WILLIAM PITT, EARL OF (1773-1857). A British diplomatist and statesman. He succeeded his uncle Jeffrey as Baron Amherst in 1797. In 1816 he was sent as ambassador to China, where he refused to perform what he thought a degrading act of kneeling, which was required of all who would see the Emperor. For this he was not allowed to enter Peking, and the object of his mission was frustrated. On the way home he was wrecked. Another ship, in which he returned, touched at St. Helena, where he had several interviews with Napoleon. He was Governor-General of India from 1823 to 1828, and for his services in conducting the first Burmese War he was created an earl in 1826. Consult Mrs. A. I. Ritchie, *Lord Amherst and the British Advance Eastward* (1842).

AMHERSTBURG. A town and port of entry in Ontario, Canada, on the Detroit River, 4 miles above Lake Erie, and on the Michigan Central Railroad (Map: Ontario, A 5). The town has steamer connection with Detroit, Mich. It has a public library and is the seat of a United States consul. Amherstburg is the centre of a farming district in which corn and tobacco are raised. There are grazing lands and limestone quarries in the vicinity, and the industries include saw and flour milling and manufactures of iron and cement. This town is one of the oldest settlements in upper Canada. It was dismantled by the British in 1813 and a week later was destroyed by General Harrison, of the United States army. Pop., 1901, 2222; 1906 (local est.), 2480; 1911, 2560.

AMHERST COLLEGE. A leading American college, situated at Amherst, Mass., and founded in 1821 by Congregationalists in the interest of Christian education. Up to the year 1906 the graduates numbered 4700, of whom 1411 entered the ministry, while an equally large number became teachers. The unusual educational influence wielded by Amherst for half a century was due to a considerable extent to two of its presidents, Edward Hitchcock and Julius H. Seelye. The former was probably the most distinguished American geologist of his time, and the latter united with a broad scholarship in the humanities great ability as a practical educator. Amherst has never endeavored to become a university, but has steadily increased in efficiency as a non-specialized and non-technical liberal college. In 1912 the faculty numbered 48, and the students 421. The total value of the buildings and grounds is about \$1,000,000; the interest of over \$300,000 is used to aid needy students; the annual income of the college is about \$150,000, and the entire property under the control of the college aggregates \$3,500,000. The library contains 100,000 volumes and is the largest belonging to any purely collegiate institution in the country. Of accessories to the college may be mentioned the Hitchcock ichnological cabinet, the Adams collection in conchology, the Shepard meteoric collection, and an extensive and valuable geological and mineralogical collection gathered largely by the personal efforts of Prof. Benjamin K. Emerson. The Pratt Gymnasium, athletic field, and college hospital are the gifts of the sons of the late Charles Pratt of Brooklyn, N. Y. The presidents have been: Zephaniah Swift Moore, D.D., 1821-23; Heman Humphrey, D.D., 1823-45; Edward Hitchcock, D.D., LL.D., 1845-54; William A. Stearns, D.D., LL.D., 1854-76; Julius H. Seelye, D.D., LL.D., 1876-90; Merrill Edwards Gates, LL.D., Ph.D., 1890-99; George Harris, D.D., LL.D., 1899-1912; Alexander Meiklejohn, Ph.D., LL.D., 1912. Consult Tyler, *A History of Amherst College* (New York, 1896, 1910).

AMICABLE NUMBERS (Lat. *amicabilis*, friendly). Two numbers, each of which is the sum of the factors of the other, are called amicable numbers, as 220 and 284, e.g.:

$$220 = 1 + 2 + 4 + 71 + 142$$

$$284 = 1 + 2 + 4 + 5 + 10 + 11 + 20 + 22 + 44 + 55 + 110$$

The classification and fanciful name are due to the Pythagoreans, who made much of number mysticism.

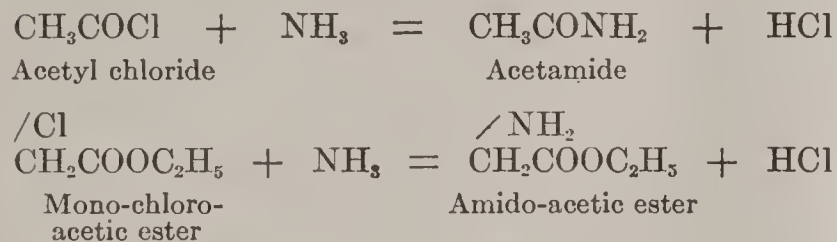
AMICE, äm'is. See COSTUME, ECCLESIASTICAL.

AMICI, ä-më'chë, GIOVANNI BATTISTA (1786-

sponding nitrils. Thus acetamide, CH_3CONH_2 , changes into CH_3CN .

The amides are all soluble in alcohol and in ether, and many are more or less soluble in water. Most of them are solid crystalline substances that can be distilled without decomposition.

The *acid amides* should be distinguished from the *amido-acids* (now more frequently referred to as *amino-acids*); compounds of the latter class may be obtained by treating the halogen-substitution products of acids, or of esters, with ammonia, while, as stated above, the acid amides are produced by the action of ammonia on the chlorides of acid radicles. The following two equations may serve to show the formation of, and the difference in chemical constitution between, an acid amide and an amido-acid:



AM'IDO-AC'IDS. See AMIDES.

AMID'SHIP, or MIDSHIP. See SHIPBUILDING.

AMIÉL, à'myél', HENRI FRÉDÉRIC (1821-81). A Swiss essayist, poet, and professor of æsthetics. He was born at Geneva, Sept. 27, 1821, and died there, May 11, 1881. He is remembered almost solely for his *Journal intime*, a diary of 1700 pages of manuscript, posthumously published in part in 1883-84 and translated into English in 1889, with a critical study by Mrs. Humphry Ward. This journal, through its singular clearness, keenness of insight, and sensitiveness to impression, is the complete revelation of a cast of mind that felt itself peculiarly modern and peculiarly entitled to be self-distressed. It expresses with masterful passion and original power the spiritual yearning and despair of a pure soul gasping in a rationalistic atmosphere. Thus Amiel is a curious projection into reality of the Shakespearean Hamlet, in whom morbid introspection numbs action. He is more fascinating than stimulating, more sombre than pessimistic, more subtle than strong. His thoughts will be cherished for the beauty and perfection of their form rather than for any tonic quality in their teaching. Less read (poetical) works of his are the poems *Grain de Mil*, *Il Penseroso*, and *Charles le Téméraire*. There is a *Life of Amiel*, by Vadier (Paris, 1885). Consult also, Bourget, *Nouveaux Essais* (Paris, 1885), Matthew Arnold's essay on Amiel, in *Essays in Criticism*, and the Introduction by E. Scherer.

AMIENS, à'myān' (from the Lat. *Ambiani*, the name of a Belgic tribe; literally 'dwellers on the water'; compare Gadhel, *abhain*, *abhuinne*, water, a river). The capital of ancient Picardy and of the present French department of Somme, situated on the river Somme, 81 miles by rail from Paris (Map: France, N., H 3). The residential section is well built with wide, well-paved streets and fine squares. The business part of the town is crossed by several canals and is rather unattractive. The old town is surrounded with boulevards, which occupy the site of the ancient fortifications, and there is in the western part an extensive pleasure ground, the Promenade de la Hotoie, used for public concerts and festivals. The world-famous cathedral is situated in the eastern part, facing the

Place Nôtre Dame. Besides being the largest ecclesiastical edifice of France, the cathedral of Amiens is also one of the finest specimens of Gothic architecture (q.v.) in Europe. Its construction was begun in 1220 by the architect Robert de Luzarches, and was continued by Thomas de Cormont and his son Renault. It was finished in 1288, but many additions have been made since; the two side towers of the façade are without spires. The length of the cathedral is 470 feet, that of the transept 213 feet, and the width of the nave 144 feet. The façade has three lofty porches profusely decorated with statuary and other sculptural ornaments. The central spire over the transept is very slender and 360 feet in height. The interior is also very imposing. The nave is 147 feet high, and the vaulting is supported by 126 columns. There are numerous chapels, and the transepts are covered with fine reliefs. At the sides of the nave are placed bronze statues of the two founders of the cathedral, and there are also large marble statues at the entrance to the choir. Besides the cathedral the most noteworthy buildings are the town hall (begun in 1550) and the Château d'Eau, where the water works of the city are situated. Of educational establishments Amiens has lycées for boys and girls, a preparatory medical school, a theological seminary, a school of music, a municipal library, with about 100,000 volumes and nearly 600 manuscripts, and the museum of Picardy, containing collections of antiquities, sculptures, and paintings. Amiens was of considerable industrial importance as early as the twelfth century, and in the sixteenth century it became one of the largest centres of the textile industry in France. At present the chief manufactures are linen, woollens, silk, velvet, and shoes. It is the seat of a bishop and of a court of appeals. Agglomerated pop., 1911, 79,070; total municipal, 87,100; counted apart, 6107; total, 93,207, as compared with 90,753 in 1901.

Amiens was anciently known as Samarobriva and was the capital of the Gallic Ambiani. Cæsar included it in Gallia Belgica, and it became a Roman stronghold; Marcus Aurelius adorned it. In the fifth century it fell into the hands of the Franks. In 1185 Philip Augustus, in consolidating the kingdom, induced Philip of Alsace to cede it to the crown. From 1435 to 1477 the city was in the possession of the dukes of Burgundy. Taken by the Spaniards in 1597, it was besieged and recaptured by Henry IV. It was the capital of Picardy until 1790. In November, 1870, it was captured by the Prussians. The famous Treaty of Amiens between Great Britain on one side and France, Spain, and Holland on the other, in which Great Britain recognized the changes made by France in the map of Europe and gave up most of her recent conquests, was signed in the hôtel de ville on March 27, 1802. Among notable men born in this city was Peter the Hermit. Consult A. de Calonne, *Histoire de la ville d'Amiens* (1900).

AMIN'ADAB SLEEK. See SLEEK, AMIN-ADAB.

AMINE, à-mèn'. The name of two characters in the *Arabian Nights*. 1. In the *History of Sidi Nouman*, his wife, whose habit of eating only so much rice as she could pick up on a bodkin excited his suspicions, and who, he discovered, partook of ghoulish feasts in the cemetery. She used also to lead her three sisters about like hounds. 2. In the story of *Three*

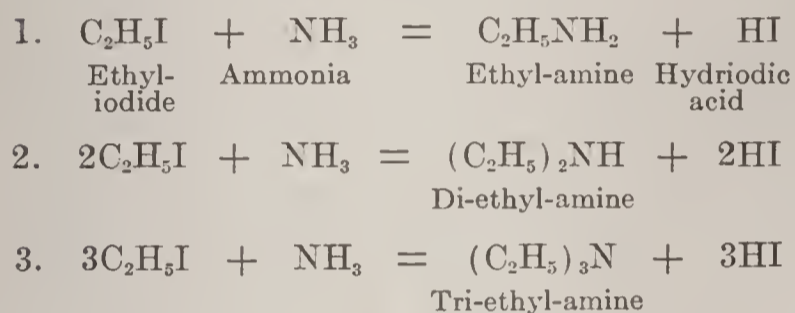


AMIENS CATHEDRAL

Ladies of Bagdad, the half-sister of Zobeide and wife of Amin, the Caliph's son, who becomes estranged from her, but is reconciled.

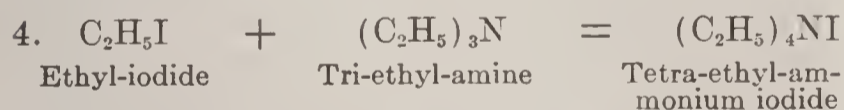
AMINES (derived from *ammonia*). A general term applied in organic chemistry to an important class of basic compounds derived by substituting hydrocarbon radicles like methyl (CH_3), ethyl (C_2H_5), etc., for one or more of the hydrogen atoms of ammonia (NH_3). The compound CH_3NH_2 is called methyl-amine; the compound $(\text{CH}_3)_2\text{NH}$, di-methyl-amine; the compound $(\text{CH}_3)_3\text{N}$, tri-methyl-amine. An amine derived by replacing one hydrogen atom of ammonia is called a *primary amine*; one derived by replacing two hydrogens is called a *secondary amine*; one derived by replacing all of the hydrogen of ammonia is called a *tertiary amine*.

The amines may be readily prepared by the action of halogen substitution products of the hydrocarbons upon ammonia (Hofmann's method). Thus, by the action of mono-iodoethane (ethyl iodide) upon ammonia, one or more ethyl groups (C_2H_5) are introduced into the molecule of ammonia (NH_3), according to the following chemical equations, which usually take place simultaneously:



As the amines are powerful bases, they combine, of course, with the hydriodic acid formed in these reactions, producing salts like $\text{C}_2\text{H}_5\text{NH}_2\text{HI}$, from which the amines are readily isolated by distilling with caustic alkalies.

Simultaneously with the above three reactions, a fourth reaction takes place: viz., between the halogen substitution product of the hydrocarbon and the tertiary amine produced in the third reaction. This fourth reaction, in the case of tri-ethyl-amine, is represented by the following equation:



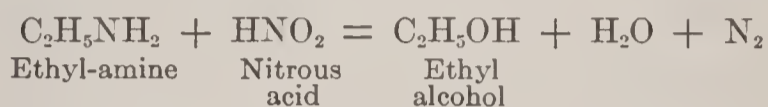
The compound formed in this reaction is evidently ammonium iodide (H_4NI), all the hydrogen of which has been replaced by ethyl-groups (C_2H_5); it is therefore named tetra-ethyl-ammonium-iodide. When treated in aqueous solution with silver hydroxide, it is transformed into tetra-ethyl-ammonium hydroxide $(\text{C}_2\text{H}_5)_4\text{NOH}$. Bases like $(\text{C}_2\text{H}_5)_4\text{NOH}$, derived from ammonium hydroxide by substituting hydrocarbon radicles like methyl (CH_3), ethyl (C_2H_5), etc., for all of its hydrogen, are termed *quaternary ammonium bases*.

The above method of preparation of the amines and the substituted ammonium salts may also serve in determining the nature of an amine. An example will render this clear: an amine found in herring-brine has the molecular formula $\text{C}_3\text{H}_9\text{N}$; is it the primary amine $\text{C}_3\text{H}_7\text{NH}_2$ (propyl-amine), or the tertiary amine $(\text{CH}_3)_3\text{N}$ (tri-methyl-amine)? To answer this question the amine may be treated with methyl iodide, and, when the reaction is completed, the resulting substance analyzed. The formation, as a

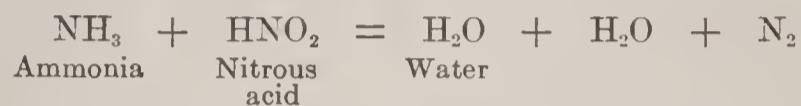
final product of the reaction of the compound $\text{C}_4\text{H}_{12}\text{NI}$, proves that the substance $\text{C}_3\text{H}_9\text{N}$, found in herring-brine, is a tertiary amine $(\text{CH}_3)_3\text{N}$, for only one methyl group (CH_3) is required to transform it into the substituted ammonium iodide $\text{C}_4\text{H}_{12}\text{NI}$ [$(\text{CH}_3)_4\text{NI}$]; while if it were the primary amine, $\text{C}_3\text{H}_7\text{NH}_2$, the number of methyl-groups taken up would be three, and the compound $\text{C}_6\text{H}_{16}\text{NI}$ [$\text{C}_3\text{H}_7(\text{CH}_3)_3\text{NI}$] would be formed. The number of groups, like methyl, ethyl, etc., taken up by an amine thus generally determines its nature.

The nature of amines is also shown by their behavior toward nitrous acid, the three subclasses of amines being characterized as follows:

1. Primary amines are converted by nitrous acid into the corresponding alcohols; thus, ethyl-amine is transformed into ethyl alcohol, according to the following chemical equation:



just as ammonia is transformed into water:

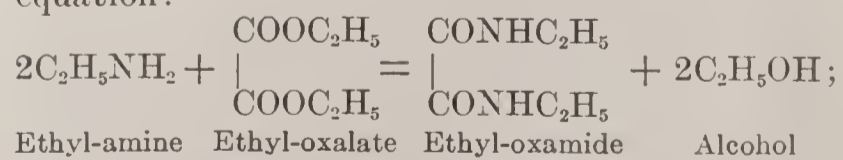


2. Secondary amines are converted by nitrous acid into compounds containing the group NO , and called *nitroso-amines*; thus, di-ethyl-amine, $(\text{C}_2\text{H}_5)_2\text{NH}$, is transformed into ethyl-nitroso-amine, according to the following equation:

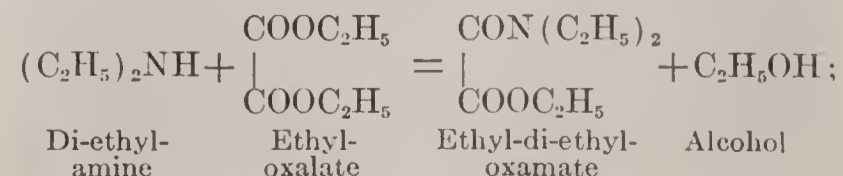


3. Tertiary amines are not affected by nitrous acid.

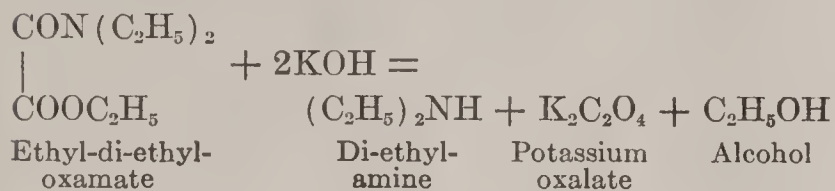
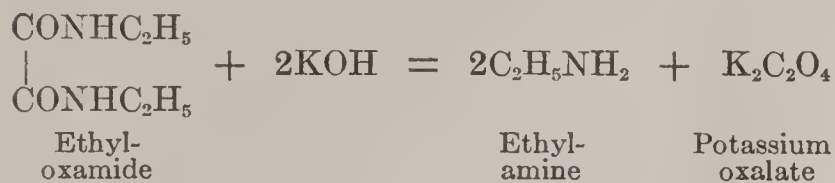
It has been stated above that when ethyl-iodide or similar substances are treated with ammonia, four reactions take place simultaneously, and a mixture of four compounds is obtained: viz., the salts of a primary, a secondary, and a tertiary amine, and a substituted ammonium iodide. The separation of the four compounds may be effected by the following method: 1. The mixture is distilled with caustic potash, which leaves the substituted ammonium iodide undecomposed as a residue, while the salts of the three amines are decomposed, and a mixture of the amines in the free state passes over in the distillate. 2. When the distillate is treated with ethyl-oxalate, the primary amine (say, ethyl-amine) is converted into a derivative of *oxamide* (the di-amide of oxalic acid, $\left. \begin{array}{c} \text{CONH}_2 \\ | \\ \text{CONH}_2 \end{array} \right\}$), according to the following equation:



while the secondary amine (say, di-ethyl-amine) is converted into a derivative of *oxamic acid* (the mono-amide of oxalic acid, $\left. \begin{array}{c} \text{CONH}_2 \\ | \\ \text{COOH} \end{array} \right\}$), according to the following equation:



the tertiary amine is not affected by treatment with ethyl-oxalate, and as it is much more volatile than both ethyl-oxamide and ethyl-di-ethyl-oxamate, it may be readily separated from these compounds by distillation. Finally, the two compounds derived respectively from the primary and secondary amines may be readily separated, since ethyl-oxamide is solid, while ethyl-di-ethyl-oxamate remains liquid on cooling the mixture. The primary and the secondary amines may be obtained separately in the free state by distilling the substances thus separated with caustic potash, the reactions taking place, respectively, according to the following two equations:



The amines are much more powerful bases than ammonia. Their odor resembles that of ammonia, from which, however, the gaseous amines may be readily distinguished by their inflammability. Many liquid and solid amines, too, have been obtained. All of the amines known have been made by artificial chemical processes, and certain amines are found among the products of decomposition of nitrogenous substances. The quaternary ammonium bases (such as tetra-ethyl-ammonium-hydroxide) are similar, and even more powerful in their action than caustic potash.

Amines containing a benzene-nucleus are classed with the so-called aromatic compounds of organic chemistry and are subdivided into *amido-compounds* and *aromatic amines* proper, according as their nitrogen is linked to the nucleus immediately, or through the medium of CH_2 -groups. Ordinary aniline is an example of amido-compound, its formula being $\text{C}_6\text{H}_5\text{NH}_2$. Benzylamine, $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$, is a true aromatic amine. The aromatic amido-compounds undergo an interesting transformation when treated with nitrous acid in the cold, the resulting substances being known as *dialzo-compounds* (q.v.).

AMINO-ACIDS. See POLYPEPTIDES.

AMIN'TA. A celebrated pastoral play by Torquato Tasso, produced at Ferrara in 1573. It is an allegory, presenting the characters of the court where Tasso lived.

AMINTE, ä'mänt'. 1. In Molière's *Les précieuses ridicules* (q.v.), the sentimental name taken by the girl Cathos. 2. A character in Molière's *L'Amour médecin*.

AMIN'TOR. The hero of Beaumont and Fletcher's *Maid's Tragedy* (q.v.), a young nobleman who, though betrothed to Aspatia, yet by the King's command marries Evadne, the heroine.

AMIOT, ä'myö'. See AMYOT.

AMIRANTE, äm'i-ränt', or **AD'MIRAL**, **IS'LANDS.** A group of islets in the Indian Ocean in lat. 5° S. and long. 53° E. (Map: Africa, K 5). They are of coral formation, belong to Great Britain, and are dependencies of the Seychelles. All the islands are fertile, and

the small population is engaged in agriculture and fishing.

AMIS ET AMILES, ä'më' zä ä'mël', also called AMIS ET AMILOUN. A *chanson de geste*, dating from the twelfth or thirteenth century. It consists of about 3500 verses, chiefly decasyllabic. Amis and Amiles are two noble knights whose close resemblance and whose friendship and mutual sacrifices are the theme of the poem. They first escape the machinations of the treacherous Hardré while in the service of Charlemagne, whose niece is given in marriage to Amis. Bellicent, the Emperor's daughter, loves Amiles, who is thereby brought into great peril, but he is rescued by Amis and obtains the princess. Amis, however, in fighting in place of his friend, has had to perjure himself. For this he is punished with leprosy, of which at last he is cured by the blood of Amiles's two sons, voluntarily sacrificed by their father. These then are miraculously restored to life.

AM'ISH CHURCH, THE. See MENNONITES.

AMISH CHURCH, THE OLD. See MENNONITES.

AMISTAD (ä'më'städ') **CASE, THE.** A case before the United States Supreme Court involving the legal status of kidnapped negroes. In 1839 some slaves recently kidnapped from Africa, who were being carried from Havana to Puerto Príncipe, Cuba, in the Spanish schooner *Amistad*, killed two of the crew, the others escaping, and ordered two whites, their owners, whose lives they spared, to steer the vessel to Africa. The latter steered north instead, and in August the vessel was captured off Long Island by a United States warship. President Van Buren wished to surrender the negroes to the Spanish government, in accordance with the treaty of 1795, as "property rescued from pirates"; but the Supreme Court finally decided (in March, 1841) that the blacks, having been originally kidnapped, were by international law, which then prohibited the slave trade, free men. The case was argued before the Supreme Court with great ability by John Quincy Adams and aroused much excitement throughout the country, especially among the radical abolitionists, who advocated violent measures to secure the release of the negroes. Consult: Peters, *Reports of United States Supreme Court XV* (Washington, 1828-43); Barber, *History of the Amistad Captives*; an interesting article in vol. xxii (N.S.) of *The New England Magazine* (Boston, 1900); *Executive Document 185*, 26th Congress, 1st session.

AMITE, ä-mët'. A town and the parish-seat of Tangipahoa parish, La., 68 miles northwest of New Orleans, on the Illinois Central Railroad, and on the Tangipahoa River (Map: Louisiana, E 3). It is the centre of a prosperous agricultural community, producing fruit, vegetables, corn, and cotton. Numerous artesian wells are used for irrigation. Amite was almost destroyed by a cyclone in 1908 and was rebuilt in less than a year. Pop., 1900, 1547; 1913 (est.), 2200.

AM'ITO'SIS (Gk. ä, a, priv. + *mitos*, *mitos*, a thread of the warp). A division (rare) of the animal or plant cell by simple constriction without the formation of nuclear figures. See CELL; MITOSIS.

AM'ITYVILLE. A village in Suffolk Co., N. Y., 33 miles by rail east of New York City, on the Long Island Railroad (Map: New York, B 3). It is on the south shore of Long Island, on Great South Bay, and the excellent bathing, boating, and fishing facilities make it a popu-

lar summer resort and place of residence. There are sanitariums, an infirmary, an academy, and several club buildings. Pop., 1890, 2293; 1900, 2038; 1910, 2517; 1913, 2850.

AM'LET, DICK, or RICHARD. In Vanbrugh's play, *The Confederacy* (q.v.), the dissipated son of a vulgar old woman, who is proud of him and gives him money with which to play the fine gentleman. His breeding betrays itself, however, and he marries the daughter of Grife the Scrivener.

AM'LETH, or HAMLETH. Prince of Jutland, supposed to have lived in the second century B.C. According to Saxo Grammaticus, he was the son of Horvendill and Gerutha; and after the murder of his father by his uncle Fengo, who married Gerutha, he feigned himself a fool to save his own life. Saxo relates a number of little things regarding Amleth, which are a curious medley of sharp and lively observation and apparent madness. We are told that, on one occasion, when he visited his mother, suspecting that he was watched, he began to crow like a cock and dance idiotically about the apartment, until he discovered, hidden in a heap of straw, a spy in the person of one of Fengo's courtiers, whom he immediately stabbed; he then so terrified his mother by his reproaches, that she promised to aid him in his intended revenge on his father's murderer, and, according to the old chronicler, really did so. Scandinavian traditions confirm the existence of a prince of this name. In the vicinity of Elsinore is shown a suspiciously modern-looking pile of stones, which bears the name of Hamlet's grave. Saxo himself does not mention the manner or circumstances of Amleth's death; but the French translator, Belleforest, says, in his *Histoires tragiques* (1564), that he was murdered at a banquet. Most of the recent historians of Denmark consider the history of Amleth fabulous. As the ultimate source of Shakespeare's tragedy of *Hamlet*, it possesses a perennial interest for all the civilized world. There are two Hamlet sagas in Icelandic, one of which, the romantic *Ambales Saga*, has been edited and translated, with an introductory essay, by I. Gollancz (1898).

AM'LVCH, äm'luk. A seaport town of Anglesey, North Wales, on the northern coast of the island, 14 miles northwest of Beaumaris (Map: Wales, B 3). It is a busy but rather dirty town, and derived its importance and wealth almost entirely from the rich Parys and Mona copper mines in the vicinity. Copper-smelting was carried on extensively in Amlwch, but this industry has died down considerably. A harbor, capable of receiving vessels of 600 tons burden, was formed by excavation out of the solid slate rock, at the expense of the mining companies. Some slate is quarried, and there are iron foundries and tobacco and fertilizer works. Pop., 1891, 5400; 1901, 5300; 1911, 4837.

AM'MAN. See RABBAH.

AMMAN, JOBST (Jost, Jos, Justus) (1539-91). A German engraver and designer of the Renaissance. He was born at Zürich, the son of a professor, and grew up in the cultured circle about Zwingli. His teachers in art are unknown, but his earliest independent work is certain designs for stained glasses, executed in Basel (1557) and now in the Museum there. In 1561 he was at Nuremberg, probably in the atelier of the engraver Virgil Solis, whom he succeeded as illustrator for the publisher Feycrabend. For the latter he designed the wood cuts for the

Frankfort *Bible* of 1565 and the etchings for Frunsberger's *Kriegsbuch* (1573). In 1577 he became a citizen of Nuremberg, where he was held in the highest honor by distinguished contemporaries. They hailed him "absolutissimus pictor" and as the Apelles of his day, but modern criticism takes a less exalted view. His drawing is indeed fair, his execution spirited, his manner neat and decided; but his elongated figures are often mannered, and the enormous volume of his work, necessitated by financial straits, injuriously affected its quality. But considered as illustrations, his thousands of drawings are charming and interesting in the extreme. They show a rich, full knowledge of life, a sparkling humor, and form an incomparable source of the history of civilization. His aquarelles and wash drawings are of particular charm. Some are family trees and family books of Nuremberg patricians, still in private possession there; others are taken directly from life, like "The Entrance of Emperor Maximilian II into Nuremberg," containing 450 figures, in the cabinet of prints in Munich, which possesses other fine examples. But of greatest importance are his drawings for wood cuts, through which he exercised the widest popular influence of any artist of his day. He drew directly on the wood, and sometimes even cut the engravings himself, as in the *Kartenspielbuch* (1588). Of special importance are the 115 wood cuts of the arts and trades, with text by Hans Sachs (Frankfort, 1568), and his *Book of Hunting* (1584). His best etchings are in Jamnitzer's *Book of Perspective* (1568). Consult Ammann, *Geschichte der Familie Amman von Zürich* (Zürich, 1904), and Andresen, *Der deutsche Peintre-Graveur* (Leipzig, 1864-66).

AMMAN, JOHANN KONRAD (1669-1724). A Swiss physician and one of the earliest writers on the instruction of the deaf and dumb. In his work, *Surdus Loquens* (1692), he describes the process employed by him in teaching, which consisted principally in fixing the attention of the pupils on the motions of his lips and larynx while he spoke and inducing them to imitate him until they could utter distinct words. He practiced in Holland.

AMMANATI, äm'mä-nä'tè, BARTOLOMMEO (1511-92). An Italian architect and sculptor, born at Settignano; one of the foremost artists of the late Renaissance, at first a pupil of Baccio Bandinelli, and afterward, at Venice, of Sansovino, whom he assisted in connection with the Library of St. Mark. On his return to Florence he came under the influence of Michelangelo's Medici Sacristy sculptures. Like other sculptors of his time, he was much influenced by the discovery of the Farnese Hercules in 1540. He went to Rome and collaborated with Vignola at the Villa of Pope Julius III. He returned to Florence in 1557, became architect of Cosmo de' Medici, and devoted himself thenceforth to the beautifying of his native city. His Santa Trinità Bridge, several fountains, and small private palaces (Pucci, Giugni) are successful; but his great courts of the Pitti Palace and Santo Spirito are less commendable; in the first-named he sought to combine the massive rustications of Brunelleschi's front of the same palace with the classic orders, inspired perhaps by Sammichele's fortified city gates at Verona. He afterward redeemed himself in the simpler court of the Collegio Romano at Rome (1582), and in the Ruspoli Palace (1586).

AM'MEN, DANIEL (1820-98). An American naval officer. He was born in Brown Co., Ohio, entered the naval service as midshipman in 1836, and by successive promotions rose to the rank of rear-admiral in 1877. He took part in the Wilkes exploring expedition (1838-42) and in 1853 on an expedition to the Paraguay River. In 1861-62, and again in 1863-64, he served in Admiral Dupont's blockading squadron, and as commander of the gunboat *Seneca* participated in the reduction of Port Royal (Nov. 7, 1861), and took command of the forts after their surrender. He commanded the monitor *Patapsco* before Fort Macallister (March 3, 1863), and before Fort Sumter (April 7, 1863); and in the two attacks on Fort Fisher (December, 1864, and January, 1865), was in command of the *Mohican*. He served as chief of the Bureau of Yards and Docks from 1869 to 1871 and of the Bureau of Navigation from 1871 to 1878, when he retired to private life. He designed the "Ammen life raft" and the ram *Katahdin* and wrote *The American Inter-Oceanic Ship Canal Question* (1880); *The Atlantic Coast* (1883), a discriminating account, from the standpoint of a naval specialist, of the operations of the Federal navy along the Atlantic coast during the Civil War; *Country Homes and their Improvement*; and *The Old Navy and the New* (1891).

AMMERGAU (äm'mër-gou) **MYSTERY.** See PASSION PLAY.

AM'METER, or AMPERE'METER (*ampère* + Gk. μέτρον, *metron*, measure). An instrument which is used to measure the intensity of an electric current and which indicates this quantity directly in amperes (q.v.). Ammeters are constructed in numerous forms, which are based for the most part on the galvanometer (q.v.), on the intensity of attraction for soft iron exerted by a hollow coil of wire carrying a current, or on the electro-dynamometer. As the galvanometer is used to detect and measure minute currents, so the ammeter is employed in testing and engineering to indicate large currents, and to enable an observer to read directly in amperes the current flowing at any instant in a circuit. A good form of ammeter is the Weston instrument, made in the United States and used all over the world. It consists of a voltmeter (q.v.), or portable galvanometer, whose movable coil is connected in parallel with a low resistance formed by one or more copper wires. As the current in a circuit depends upon the fall in potential across a constant resistance (in this case the copper wire), the operation of the instrument will readily be seen. Numerous other forms of ammeters are constructed, the simplest of which consist of a coil of wire through which the current passes, enclosing a soft iron core suspended by a spring. The amount that this core is attracted is indicated by a pointer on a scale, which can be made regular by constructing the core of suitable shape. In other ammeters a magnetic needle is placed between the poles of a strong permanent magnet and is surrounded by coils through which the current passes. This current in passing deflects the needle by an amount depending upon its intensity. The dynamometer or some modification of it, is often used to measure alternating currents and consists of two coils, one of which is free to revolve against the action of a spring. When the current passes through the two coils, which are normally at

right angles, there is a tendency for the movable coil to take a position parallel to the other, and the amount of motion depends upon the intensity of the current.

AM'MIA'NUS MAR'CELLI'NUS. The last Latin historian of the Roman Empire. He flourished in the latter half of the fourth century and wrote a history of Rome from the accession of Nerva (96) to the death of Valens (378), designed as a continuation of the histories of Tacitus; the work was called, apparently, *Rerum Gestarum a Fine Corneli Taciti Libri*. When complete, it was in 31 books, of which only 18 (14-31) are extant, covering the last 25 years of contemporaneous history (353-378). Ammianus Marcellinus was himself a Greek, born of good family, at Antioch; but he had served for years in the army, and had risen to rank in the Eastern and Gothic campaigns before he settled down in Rome to a quiet and studious life. His book is of great importance as the conscientious work of an experienced man; but the Latin is rude, and the style is heavy and dull. The account of the events of Julian's reign is especially valuable. The edition by Gardthausen (Leipzig, 1875), long standard, has now been supplanted by that of an American scholar, C. U. Clark (Berlin, 1910). Consult also A. M. Harmon, "The Clausula in Ammianus Marcellinus," *Transactions of the Connecticut Academy of Arts and Sciences*, vol. xvi, pp. 119-245 (1910), a study of the rhythm that characterized Ammianus's prose. There is an English translation by C. D. Yonge, in Bohn's *Classical Library* (London, 1862).

AMMIRATO, äm'mê-rä'tò, SCIPIONE (1531-1601). An Italian historian of some merit. He was born in Lecce, in the kingdom of Naples, and after living in Venice, Rome, and Naples, settled at Florence. In Venice he aided in editing an edition of Ariosto. His reputation, however, rests mainly upon his *Istorie fiorentine*, which in 1570 he was commissioned to write by the Grand Duke Cosimo I, and which covers the history of Tuscany from the earliest times down to 1574. It shows distinct ability and historical acumen and is based upon original documents and other authentic sources. First complete edition, Florence, 1641-47; best modern reprint, Turin, 1859. He wrote also some discourses on Tacitus, and genealogies of the Florentine and Neapolitan families. In 1595 he was made a canon of the cathedral of Florence.

AM'MON. An Egyptian deity. His name (Egyptian *Amon*, later *Amûn*) was explained by the priests as meaning 'the hidden,' 'mysterious'; but this etymology is not reliable. Originally Ammon was merely the local god of Thebes; but after the Theban dynasties became rulers of all Egypt (beginning with the eighteenth dynasty, about 1600 B.C.), he became the official head of the pantheon and national deity of Egypt. His worship spread throughout Ethiopia and Libya, and he had a famous oracle in the Libyan Desert. The Greeks identified him with their supreme god Zeus, and named Thebes, his original seat of worship, Diospolis. In the Old Testament the city is called No-Amon, 'The City of Ammon.'

Although not originally a solar divinity, later theological schools ascribed a solar character to this god, and he was called Ammon-Rê, i.e., 'Ammon the Sun.' In his statues Ammon is generally represented in human form, with skin of a

bluish tint, and wearing a peculiar headdress, from which rise two immense feathers, while a long and narrow band hangs down behind. He often appears in the form of his sacred animal, the ram, or as a ram with a man's head. Among the Greeks and Romans, the Libyan type, with a human head bearing a ram's horns, became popular. For illustration, see EGYPT. See ANDROMEDA.

AMMON, OTTO (1842—). A German anthropologist and editor. He was born at Karlsruhe and was educated as a civil engineer, which profession he followed from 1863 to 1868. He then became a publisher and editor, but in 1883 began to devote himself to literary work and afterward made several important contributions to sociological and anthropological literature. He was the discoverer of the so-called "Ammon's law," that the Teutonic race betrays almost everywhere a marked tendency toward city life, which he has demonstrated in a series of interesting measurements of the physical characteristics, especially of the head, of thousands of conscripts in the Baden army, showing radical differences between the form of the head in city and country and between the upper and lower classes in the larger towns. His chief works are: *Die natürliche Auslese beim Menschen* (Jena, 1893); *Die Gesellschaftsordnung und ihre natürlichen Grundlagen* (Jena, 1895; 3d ed., Jena, 1900). *Zur Anthropologie des Badens* (Jena, 1899); and important articles as follows: "Die Geschichte einer Idee," *Rundschau* (Berlin, 1896), on the physical types of city populations; "Der Abänderungsspielraum," *Naturwissenschaftliche Wochenschrift* (Berlin, 1896); "Die Menschenrassen in Europa," *Rundschau* (Berlin, 1896); *Die Körpergrösse der Wehrpflichtigen in Baden, 1840-64* (Karlsruhe, 1849); *Anthropologische Untersuchungen der Wehrpflichtigen in Baden* (1890).

AMMONIA. See ANTIDOTE.

AMMONIA (Gk. ἀμμωνιακόν, *ammōniakon*, rock-salt), NH_3 . A colorless, pungent, combustible, gaseous compound of nitrogen and hydrogen. It was known to the ancients as volatile alkali and is said to have been called *vehement odor* by Pliny. Its name is believed to be derived from Zeus Ammon, near whose temple in Libya, Upper Africa, it was first produced by burning camels' dung. Others derive it from Ammonia, a Cyrenaic territory. In 1774 Priestley obtained it by boiling its aqueous solution and collecting the gas, which he termed *alkaline air*, over the mercurial pneumatic trough. Scheele showed that it contained nitrogen, and Berthollet, in 1785, demonstrated its composition. Free ammonia does not occur in nature, but its salts are found in the atmosphere and in rain-water, in mineral and sea waters, in most plants, and as a product of the decay of nitrogenous organic bodies.

It may be made by heating ammonium chloride with lime. The principal commercial source of ammonia has until recently been from the destructive distillation of coal in gas making. In the distillation of coal in a retort, there is obtained, first, illuminating gas, and, secondly, a liquor which contains ammonia. Allowing this liquid to settle, the aqueous portion separates, from which free ammonia is first expelled by means of steam, after which the liquor is treated with lime and further steam to expel the fixed ammonia. The steam, ammonia, and other gases are passed through strong sulphuric acid in lead

tanks, and the crystals of ammonium sulphate which then form are removed from time to time by means of ladles, while the free ammonia is collected in water yielding aqueous ammonia or hartshorn, a transparent, colorless, alkaline liquid with an acrid, caustic taste and pungent odor. When exposed to the air, it loses ammonia, and when reduced to minus 40°C . it freezes.

On account of its nitrogen content, ammonia, in the form of its salts, is an extremely important ingredient of artificial fertilizers. The world's demand for nitrogenous fertilizers is rapidly growing, and the consumption in 1911 amounted to \$190,000,000. The value, therefore, of an industrial method for making ammonia artificially (synthetically) from hydrogen, which is a by-product in many industries and can be obtained cheaply, and from nitrogen, of which the atmosphere contains an unlimited supply, promises to be very great. Such a synthetic process has been invented by Professor Haber (q.v.) of Berlin and Dr. Carl Bosch of the *Badische Anilin und Soda Fabrik*, and is now used on an industrial scale. It has long been known that minute quantities of ammonia are produced by the silent discharge or by a series of electric sparks in a mixture of hydrogen and nitrogen. In 1881 minute traces of ammonia were obtained by Johnson, by passing a mixture of the component gases over spongy platinum. But the history of the new synthetic ammonia industry commences really in 1904, when Haber and Van Oozdt undertook a purely scientific study of the subject. Many reactions are known which do not proceed to completion. For example, if we should mix 60 grams of acetic acid with 46 grams of alcohol and allow the mixture to stand for an indefinite period of time, 40 grams of the acid would combine with $30\frac{2}{3}$ grams of the alcohol, and there the reaction would stop. In scientific language one would say, "The reaction has reached equilibrium" (for the theory of chemical equilibria, see REACTION). Haber undertook an investigation of the chemical equilibrium of the combination of hydrogen and nitrogen. But while the combination of acid and alcohol just referred to stops after no less than 67 per cent of the substances have combined, Haber found that the combination of hydrogen and nitrogen stops after only 0.02 per cent have combined. In other words, for every 100 parts of ammonia that should have been obtained if the reaction proceeded to completion, only 0.02 parts were actually obtained on account of the reaction reaching an inconvenient equilibrium. In 1908 Haber and Le Rossignol found that even that small yield had been overestimated, and so on the face of it the manufacture of synthetic ammonia appeared to be a dream. And yet four years later, in 1912, the building of a large industrial plant for the manufacture of synthetic ammonia was begun at Oppau, near Ludwigshafen-on-the-Rhine in Germany.

The general theory of chemical equilibria permits of foreseeing that the equilibrium of hydrogen and nitrogen combination would be greatly influenced by the temperature at which the reaction takes place, and that the lower the temperature the greater would be the percentage yield of ammonia. The case of ammonia is, therefore, quite similar to that of sulphuric acid, for here too the yield of sulphur trioxide from a given quantity of sulphur dioxide and

oxygen is the greater the lower the temperature. Another prediction of the theory of chemical equilibria is that the yield of ammonia will be the better the greater the pressure under which the components are caused to combine. Experiment soon confirmed the correctness of both of these theoretical deductions. Thus, at 800° C. (1472° F.) and under a pressure of one atmosphere the yield of ammonia was only 0.01 per cent, while at 500° C. (932° F.) the yield rose to 0.13 per cent. Again, when at 800° C. the pressure was raised from 1 to 100 atmospheres, the yield of ammonia rose from 0.01 to 1.1 per cent; and when the pressure was similarly increased at 500° C., the yield rose from 0.13 to 10.8 per cent. The dream of the synthetic production of ammonia was thus turning into a reality. But there were still immense difficulties to overcome. In the first place, at temperatures low enough to give a good yield, the velocity of the reaction is impracticably small for commercial purposes. The only way to hasten a reaction without raising the temperature is to employ catalyzers. Theoretically the phenomena of catalysis are still, unfortunately, quite obscure (see CATALYSIS); hence, at this point the practical investigation, no longer guided by the light of scientific theory, must needs assume the form of a blind search. Thousands of trials were made, and a number of substances were found that greatly hastened the reaction. While platinum was found to be almost worthless, the similar metal osmium appeared as the best catalyzer of ammonia formation. However, this metal is too rare and costly to be of practical promise. But uranium, manganese, pure iron, and certain other cheap and readily procurable substances were found to be sufficiently powerful catalyzers, and it was further discovered that the admixture to them of traces of certain other substances (certain metals, caustic soda, lime, common salt, etc.), called "promoters," increased their catalytic power still further. On the other hand, the catalyzers, as well as the reacting gases themselves, must be all but absolutely free from certain impurities (sulphur, phosphorus, arsenic, and other metalloids) which act as powerful "poisons." Thus, the presence of only 0.01 per cent of sulphur in iron renders it useless as a catalyzer. The difficulty of preparing on an industrial scale substances of such extraordinary degree of purity, and of guarding against the veriest traces of impurity finding their way to the catalyzer and reacting gases during operation, discouraging as it seemed at first, was finally overcome. To-day the new industry, with its great promise for the future, stands as a monument of the ultimate practical utility to mankind of the abstract thought of "pure science."

Another promising method of making ammonia consists in the action of water or alkalies upon many nitrides (compounds of nitrogen with other elements), particularly the nitrides of calcium, aluminium, silicon, and titanium. Calcium nitride is readily produced by the action of nitrogen upon calcium carbide; the nitride of silicon is produced by the action of nitrogen and carbon upon silica (sand); etc. This method, too, is now used more or less on an industrial scale.

Dry ammonia can be liquefied by pressure, provided the temperature does not exceed 130° C. (266° F.), which is its "critical temperature." The liquid has a specific gravity of only 0.63 at 0° C. Its vapor pressure equals one atmos-

phere at -32° C., which is therefore its boiling point. In many ways liquid ammonia greatly resembles water. Thus its molecules, like those of water, are associated into complexes, its latent heat of vaporization is very high (see under REFRIGERATION, the use of ammonia in the Carré and Linde processes for the production of artificial cold), and it exhibits many abnormalities of physico-chemical behavior similar to those of water. This suggested an investigation of liquid ammonia as a solvent. The study was taken up by E. C. Franklin with collaborators and yielded a variety of interesting results. For example, pure ammonia, like pure water, is a very poor conductor of the electric current. But when a salt is dissolved in it, the conductivity becomes very good, showing that salts are dissociated in ammonia as well as in water.

Ammonia gas is extremely soluble in water (one volume of water dissolves under certain conditions 700 to 800 volumes of the gas). The solution gives a "strongly alkaline" reaction with litmus, and yet ammonia, or rather its hydrate, ammonium hydroxide NH_4OH , existing in solution must be recognized as a very weak base. This is shown by the electrical conductivity of the solution being very small by comparison with a solution of sodium or potassium hydroxide, and also by the fact that these latter alkalies, when added to the solution of an ammonia salt, deprive this salt of its acid almost completely.

Ammonium sulphate, which is a white crystalline compound, is largely used both alone and in mixtures as an artificial fertilizer; it is also used in the manufacture of alum and in the preparation of other ammonium salts. Ammonium chloride, called also *sal ammoniac*, is used in pharmacy, in dyeing, and as a convenient source of ammonia. Ammonium carbonate, called also *sal volatile*, is used for scouring wool, for dyeing, and as a baking powder. Consult: Arnold, *Ammonia and Ammonia Compounds* (London, 1889); Lunge, *Coal Tar* (London, 1882); Berntsen, "Synthetic Ammonia" in *Transactions of the Eighth International Congress of Applied Chemistry*, vol. xxviii, p. 182 (New York, 1913); Haber and Van Oozdt, *Zeitschrift für anorganische chemie*, vol. xliii, p. 111 (1904); Haber and Le Rossignol, *Berichte der deutschen chemischen Gesellschaft*, vol. xl, p. 2144 (1907); Haber and Le Rossignol, *Zeitschrift für Elektrochemie*, vol. xiv, p. 181 (1908); Haber, *Zeitschrift für Elektrochemie*, vol. xvi, p. 244 (1910).

AMMO'NIAC (Lat. *ammoniacum*, Gk. *ἀμμωνιακόν*, *ammōniakon*, gum-ammoniac), or GUM AMMONIAC. A gum-resin, used medicinally in certain plasters. It is obtained from the *Dorema ammoniacum*, an umbelliferous plant found in Persia and Turkestan. The gum is made by drying the milky juice of the plant. It occurs in commerce either in tears, or in masses formed of them, but mixed with impurities. It is whitish, becoming yellow by exposure to the atmosphere, is softened by the heat of the hand, and has a peculiar heavy smell and a bitter taste.

AM'MONI'ACAL COP'PER CAR'BONATE. See FUNGICIDES.

AMMON'IFICA'TION. The term applied to the transformation of organic nitrogenous compounds into ammonia through the action of micro-organisms. See NITRIFICATION.

AMMONITE (derived from *ammonia*). A trade name of a fertilizer rich in nitrogen (13 to 14 per cent), obtained largely from rendering establishments and beef-extract factories. It is practically identical with the "dried meat meal" or "azotin" found on the market as a fertilizer. See MANURES AND MANURING.

AMMONITES, äm'mön-its. A people allied to the Moabites, and also (though less closely) to the Israelites. According to Gen. xix. 38, they were descendants of Ben-Ammi, the son of Lot, and while this account is fanciful, there is no reason to doubt the relationship implied between Ammonites and Moabites. The Ammonites inhabited the country east of the Jordan, between the rivers Arnon and Jabbok, i.e., the desert country east of Gad. Their chief city was Rabbath Ammon (Deut. iii. 11; Ezek. xxi. 20), known as Philadelphia in the time of the Greek occupation and at present as Amman. The relation between the Ammonites and Israel was almost continuously hostile. Jephthah defeated them with great slaughter (Judg. xi. 4-33; xii. 28 may be a later interpolation); they were also overcome by Saul (1 Sam. xi. 1-11) and were subdued with great severity by Joab and David (2 Sam. xii. 26-31). A precious stone from the crown of the statue of Milkom, their god, which weighed a talent of gold, was placed on David's head, and the Ammonites were put to forced labor. After the disruption of Solomon's kingdom the Ammonites attacked Gilead, perhaps together with the Assyrians (2 Kings xv. 29; 1 Chron. v. 26), for which they are denounced by the prophets Amos (i. 13), Zephaniah (xxviii., xxix.), Jeremiah (xlix. 1-7), and Ezekiel (xxi. 28-32). In the days of Jehoshaphat the Ammonites made an abortive attempt to attack Judah (2 Chron. xx. 1-30), and later they were defeated by King Jotham (2 Chron. xxvii. 5). After the captivity an Ammonite, Tobiah, was among the enemies of Nehemiah, though he maintained friendly relations with the nobility and priesthood in Jerusalem (Neh. iv. 1-15; vi. 17; xiii. 4). In the days of Judas Maccabæus the Ammonites, together with their Syrian allies, were thoroughly routed by the Jews (1 Maccabees v. 6). Justin Martyr affirms that in his time (about 150 A.D.) the Ammonites were still numerous. The chief deity worshiped by the Ammonites was Milkom, which signifies 'king' (1 Kings xi. 5, 7-33), who bore the same relation to his people as Chemosh did to Moab and Yahwe to Israel. He was the natural protector to whom they looked for succor in distress. Of the rites of the Ammonites we know very little, but the worship was probably similar to that of the Moabites as well as to that of the Israelites in the early stages of their history. The Ammonitish language, likewise, was practically identical with Moabitish and ancient Hebrew, the differences between them being merely of a dialectical order. See the commentaries on Gen. xix. 38, by Dillmann, Delitzsch, Gunkel, Holzinger, Skinner, and Driver.

AMMONITES, äm'ö-ni'téz. A generic name given by Lamarck and L. von Buch to a group of tetrabranchiate cephalopod shells found in the Mesozoic rocks of Europe. A still earlier name applied to them by the alchemists and others of the Middle Ages was Cornu Ammonis, from a fancied resemblance to the horns of Zeus Ammon. The term "Ammonites" has, as a generic name, fallen into disuse, for more recent re-

searches have shown that Von Buch's name included a large array of species that present characters not only of a generic but also of family rank. The name is, however, still used in a loose way to distinguish those Mesozoic cephalopods, with complicated suture lines, from the Palæozoic Goniatites with more simple sutures. Von Buch's three genera, Ammonites, Ceratites, and Goniatites, with their numerous species, have been broken up into a host of new generic terms, about 50 in number, and these latter have been grouped into about 90 families, all of which are included in the order Ammonoidea. For the structure of the shell, the distribution of the species, and the geological history of the group, see CEPHALOPODA.

AMMONIUM (from *ammonia*), NH₄. A chemical radicle composed of one atom of nitrogen and four atoms of hydrogen. This radicle or atomic group acts like the univalent elements sodium and potassium and is contained in ammoniacal salts. An amalgam, too, has been obtained in which it exists in direct combination with mercury. Ammonium amalgam is a pasty, lustrous, metal-like substance formed by passing an electric current through ammonium chloride in contact with mercury. It can also be obtained by the action of sodium amalgam (liquid) upon a strong aqueous solution of ammonium chloride: the sodium amalgam turns into ammonium amalgam and becomes rigid. It is an unstable body, which readily decomposes, giving off ammonia and hydrogen.

AMMONIUM. See SIWAH.

AMMONIUM SULPHATE. A high-grade nitrogenous fertilizer (about 20 per cent nitrogen), obtained largely as a by-product of gas works, coke ovens, etc. See MANURES AND MANURING.

AMMONIUS (Gk. Ἀμμώνιος, *Ammōnios*). An Alexandrian philosopher of the third century A.D., surnamed Saccas ('sack-carrier'), because, it is said, he had been a porter in his youth. He was of Christian parentage, but, according to his most eminent pupil, Plotinus, his studies led him to abandon Christianity for the old Greek religion; this is denied, however, by Eusebius and St. Jerome. Longinus says that as a philosopher he surpassed all his contemporaries; his teaching was directed chiefly toward harmonizing the doctrines of Plato and Aristotle, and through his disciples he became the founder of the Neo-Platonic school of philosophy. Among his pupils were Origen the Neo-Platonist, Origen the Christian, Longinus, Herennius, Theodosius, Antoninus, and Plotinus. Ammonius left no writings, but his esoteric teachings were spread by Origen and Herennius, and especially by Plotinus.

Ammonius was the name of several other learned men in the later periods of Greek history: Ammonius, a Peripatetic philosopher of the first century, the teacher of Plutarch, the first, so far as we know, to give to the teachings of Plato that religious-mystic coloring which became predominant later; Ammonius, a Christian philosopher of Alexandria in the third century, who wrote a work on the agreement of the teachings of Moses and Jesus, and composed a harmony of the Gospels; Ammonius, son of Hermeas, a Peripatetic philosopher of the fifth century A.D., disciple of Proclus and author of commentaries on Aristotle; Ammonius, the famous surgeon of Alexandria, who lived in the latter half of the first century B.C.—he first prac-

liced lithotomy; Ammonius, the grammarian, pupil of Aristarchus, and his successor as head of the Alexandrian school.

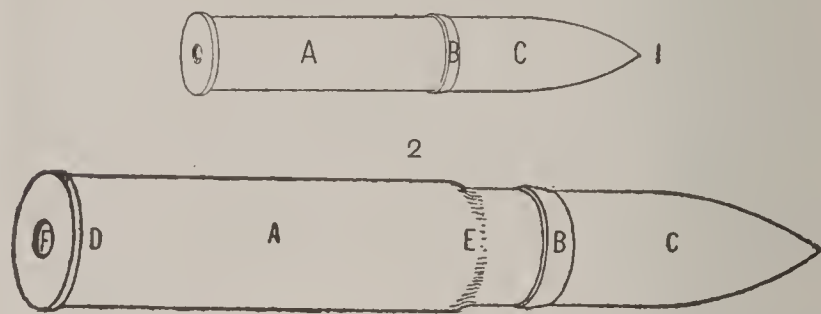
AM'MONOID'EA. An order of tetrabranchiate cephalopods, equivalent in rank to the Nautiloidea. It contains more than 5000 species, all of which are extinct and found in a fossil state in marine rocks of Devonian and Carboniferous, and abundantly in those of Mesozoic age of all parts of the world. The form of the animal in this order is unknown; but from the structure of the shell it is supposed to have a form like that of its only living ally, the nautilus, though of a more delicate construction, and to have been a crawler instead of a swimmer. The shell is coiled in a single plane, with its apex in the centre of the coil, and it is usually compressed into a discoid. This discoid form is in some phylogerontic or senile types of Mesozoic Age changed to a turreted or irregular or straight shell. The 5000 species of the order are grouped under about 500 genera and some 98 families, according, chiefly, to the form and mode of development of the so-called suture lines, which are the lines of union of the internal septal walls with the inner wall of the shell. The order is of peculiar interest, in that, of all groups of animals, it furnishes the finest illustrations of evolution, and the laws of growth and decline, of ontogeny and phylogeny; in other words, of bioplastology. For more particular information and illustrations, see CEPHALOPODA.

AMMONOO'SUC, UPPER, LOWER, and WILD. The name of three rivers in New Hampshire. The UPPER AMMONOOSUC rises in the Randolph range of the White Mountains, flows to the north, then turns westward, draining an area of 252 square miles in Coos County, and empties into the Connecticut below Groveton (Map: New Hampshire, G 3). The LOWER AMMONOOSUC rises in the west slope of the Presidential Range in Coos County, flows westward, enters Grafton County, and then flows south-westward for a total length of nearly 100 miles, emptying into the Connecticut at Wells River (Map: New Hampshire, F 4). The WILD AMMONOOSUC flows into the Lower Ammonoosuc near Bath.

AMMOPH'ILA (Gk. ἄμμος, *ammos*, sand + φίλος, *philos*, friend, loving). A genus of grasses distinguished by a spike-like panicle and by the character of the glumes, which are nearly equal, keeled, longer than the paleæ of the single floret, and surrounded at the base by a tuft of hairs. *Ammophila arenaria* or *Ammophila arundinacea*, formerly called *Arundo arenaria*—a grass about two to three feet high, with rigid bluish leaves, the edges of which are rolled in, and creeping rootstocks—is frequent on sandy shores of Great Britain and the Continent of Europe. It is sometimes called beach grass, sea reed, or sand reed, and sometimes mat grass, because the culms are wrought into foot-mats, coverings for stairs, etc. It is also called *marram*, by which name it is designated in laws both English and Scottish, by which the destruction of it was prohibited under severe penalties, because of its great utility in fixing the shifting sand. In Holland and in Norfolk, as well as in the United States, it is extensively employed—along with the sea lyme grass (q.v.)—in preserving the banks of sand which prevent the inroads of the sea. It is of little value as food for cattle, although they eat the very young leaves. The

fibre has been used instead of flax, but is too short. Beach grass has been used in the manufacture of paper of coarse quality.

AM'MUNI'TION (Fr. *amunition*, probably by wrong division of *la munition* into *l'amunition*; from Lat. *munire*, to fortify, defend). A term which embraces all the ordnance stores used in the actual firing of guns of every sort and calibre, and which includes gunpowder, projectiles, primers, and their accessories. When the powder, projectile, and primer are so combined in a single piece as to be ready for firing as soon as placed in the gun, the packages so formed are called *fixed ammunition*; the term is also extended to ammunition for large guns in which the powder is inclosed in a primed metallic case, but loaded separately from the projectile. This type is now very little used. In small arms the ammunition is invariably of the fixed type. For heavy guns the ammunition is almost universally fixed for calibres of less than four inches. Above this, the practice is not uniform in all countries or in all classes of



FIXED AMMUNITION—UNITED STATES NAVY.

1. One-pounder. 2. Six-pounder, three-inch and four-inch.

- A. Brass cartridge case, bottle-necked at E.
- B. Rotating band (copper).
- C. Projectile.
- D. Base of cartridge case.
- E. Bottle-neck of cartridge case.
- F. Primer.

guns. In the United States naval guns of 1899 and later models, fixed ammunition is used for calibres not exceeding four inches; guns of five-inch calibre on the recent battleships have charges in primed brass cartridge cases, but the projectile is not attached to it but is separately loaded into the gun. Some guns of five-inch calibre and all larger pieces have the charges put up in cartridge bags. A form of lock, which automatically ejects the primer, assists to make the loading with powder in bags about as rapid as if it were incased in metal. The metallic cartridge cases used for fixed ammunition are now generally made of hard drawn brass of the best quality, stamped from sheets or plates of varying thickness, depending upon the calibre of the gun for which they are designed. The circular disk cut from the sheet or plate is first given the form of a shallow cup and then drawn out and pressed into finished shape. The cases usually have a rim around the base, but some have a groove, called a *cannelure*, sunk into and surrounding the base; the chief use of both rim and cannelure is to enable the extractor to take hold of and extract the empty case after firing; but the rim also assists to hold the case in its proper position in the gun. The high velocity given the projectile in a modern gun entails the use of a relatively large charge of powder; to hold this, and to avoid undue length of case, which involves unnecessary weight and introduces difficulties in connection with vibrations and pressures,

the case is increased in diameter over the powder and drawn down to form a bottle-neck where it grips the projectile. No paper cases are used for military or naval arms, but the cases for the ammunition of breech-loading shot-guns have the cylindrical portion of cardboard or *papier-maché*, the base being of brass formed in the manner already described.

Gunpowder (see EXPLOSIVES; GUNPOWDER), the propelling force in all military weapons in general service, is put up, for guns of large calibre, in bags made of some sort of cloth, usually serge or silk. For convenience of handling, the charges are divided into sections when the weight of the full charge exceeds 100 pounds. Powder charges, when in bags, are stowed in water-tight copper tanks in compartments or buildings called magazines; on shipboard, magazines are placed below the water line, near the bottom of the ship, and as far away as practicable from the heat of boilers and engines, and are artificially cooled by refrigerating apparatus. Temperatures exceeding 90° F. injuriously affect the stability and ballistic qualities of the powder. Such temperatures do not render a well-made powder dangerous until long after its ballistic properties are ruined. Great care is also taken to keep hygrometric condition of magazines constant, as this is quite as important as the temperature in securing even combustion and pressures in the gun. In fortifications the magazines for war service are below ground or behind ample protections. Fixed ammunition is stored in rooms similar to magazines, as are also projectiles.

Powder charges, whether in metallic cases or in bags, are ignited by primers; these are of four types: percussion, friction, electric, and combination (percussion and electric). Percussion primers resemble miniature fixed ammunition; in the United States navy percussion primers are used only in one-inch, three-inch, and six-inch powder ship guns and in three-inch ship and field guns. They are about an inch long, one-fifth of an inch in diameter in the body, and enlarged considerably at the base; they contain 42 to 270 grains of fine powder in the body, and a primer cap in the head, which will ignite when struck by the firing pin of the gun lock. Friction primers are of the same shape and size, but are ignited by the friction caused by drawing a serrated strip of metal through the fulminate in the primer head. Their use in the United States navy has been discontinued, but they are still in some favor in other services. Electric primers differ from those already mentioned in being ignited by an electric spark instead of by friction or percussion. Single and double wire systems are employed; in guns which do not use fixed ammunition the current, furnished by a dry battery, or the dynamo, passes through a single insulated copper wire into the primer; there it encounters resistance in the shape of a bridge of platinum wire, and thence escapes through the metal of the primer to the gun and so to earth; in passing through the platinum bridge it heats the latter white hot and thus causes ignition. In guns using fixed ammunition, the electric primer is screwed or pressed into the base of the powder case; the current enters the primer through the electric primer connection, which is similar to the percussion firing pin, but is insulated in order to carry the current. The combination primer is the kind principally used in large guns of recent type

in the United States navy. It is arranged to be fired either by percussion or electricity. Electric primers are also used, but to a less extent.

Ammunition Supply. Ammunition for the supply of the artillery of the United States land service may be divided into two classes: (1) ammunition supply for all sea-coast guns permanently mounted in fortifications; (2) the ammunition supply for the mobile army, including small arms, field artillery, heavy field artillery, and siege artillery, all of which accompany an army in the field. The supply for sea-coast guns is stored in magazines under the emplacements of the guns. For calibres up to and including 4.7-inch, fixed ammunition is used, while separate loading of charge and projectile takes place for calibres above 4.7-inch.

The ammunition supply for the mobile army includes ammunition for small arms (rifles, machine guns, and pistols) and ammunition for the field artillery, which in the United States includes the following calibres: 2.95-inch mountain gun, 3-inch field gun, 3.8-inch field howitzers. These all employ fixed ammunition, and the weights of projectiles are as follows: 12 lbs., 15 lbs., 30 lbs., respectively. Such artillery forms the divisional artillery, accompanying a division in the field. In addition, in the rear of a field army with the auxiliary troops, there are the 4.7-inch gun using fixed ammunition, and the 6-inch howitzer, with weights of projectiles, 60 lbs. and 120 lbs., respectively. These two arms are classed as heavy field or siege artillery, but are sufficiently mobile to accompany or follow an army in the field.

The question of maintaining a sufficient supply of ammunition has become one of increasing importance and difficulty, on account of the increasing demands for artillery support in battle, which demands have been met by recent improvements in ordnance affording greater rapidity of fire in both small arms and artillery. The supply of ammunition is maintained as follows: 1st. By *combat trains* composed of ammunition wagons (q.v.) which accompany battalions of infantry (two to each battalion) and squadrons of cavalry (one to each squadron), and caissons (12 to each battery) which accompany artillery to the vicinity of the fight. 2d. By *ammunition trains* which are held in rear to resupply the combat trains.

The ammunition of a normal division of about 18,000 men requires, for small arms, three wagon companies (81 wagons in all); for artillery, 2 wagon companies (54 caissons in all): a total of 135 wagons. In addition to this, the depots established in rear of the army must be kept supplied from arsenals in order to meet the rapid consumption of ammunition at the front. The ammunition and combat trains, with the ammunition carried on the person and on the guns, provide for 330 rounds per rifle and 464 rounds per gun.

The difficulty of devising practical methods and means of supplying a moving army composed of several divisions is apparent. In modern armies the study of this subject has been given the greatest attention.

The question of ammunition was one of the subjects of the Peace Congress held at The Hague in the summer of 1899, and strong recommendations were made to discountenance the use of explosive or expanding bullets. The English in the Sudan, and in smaller Indian punitive

expeditions, found that the smallness, shape, and velocity of a modern rifle bullet had not a sufficiently deterring effect on the charging masses of tribesmen, and frequently used the so-called dum-dum bullet, which is made of softer metal and expands on contact. During the Boer War dum-dum and explosive cartridges were frequently found after the various battles, each side charging the other with having used them. In modern wars the small, clean-cut wounds caused by the bullets of high-power rifles have been found fatal only in a small percentage of cases. Instances are frequent where men continued to fight for some time after being hit.

In England, and Europe generally, all government-made ammunition is manufactured at the government arsenals. See ARSENAL.

The word "ammunition" is still retained in the English services in its early English form, as pertaining to certain forms of military supplies; ammunition shoes, ammunition socks, ammunition bread, ammunition shirts, etc., as distinct from the same articles supplied from purely civil sources. See PROJECTILES; FUZE; PRIMER; CARTRIDGE; ORDNANCE; ARTILLERY; COAST ARTILLERY.

AMMUNITION CHESTS. Boxes containing ammunition, packed so as to be fitted for transport by either elephant, camel, bullock, pack-horse, or mule; or in the case of horse and field artillery so arranged that the gunners may utilize them for seats or pack them in caissons. In the United States Field Artillery the words "ammunition chests" designate specifically the rectangular steel boxes permanently fastened to the limbers and caissons. The limber chest carries 36 rounds, the caisson chest 70 rounds, each round being provided with its own compartment. Seats for cannoneers are provided on the lids of these chests.

AMMUNITION WAGON. A specially built wagon for the safe and speedy transport of ammunition. The general use of rapid-fire rifles and guns has made the question of suitable wagons, capable of carrying the large quantities of ammunition demanded by modern arms and warfare, one of the most important features of a campaign. Such wagons need great strength, easy draught, flexibility, and adjusted balance. They must also be so arranged that the shells and fuses are held firmly in place. In the United States army vehicles carrying artillery ammunition assigned to batteries are called caissons. Twelve caissons accompany each battery of four guns. Two ammunition wagons carrying small-arm cartridges accompany each battalion of infantry. Only one such wagon is assigned to a squadron of cavalry. See AMMUNITION.

AMNESIA, *ăm-nē'zhī-ă*, loss of memory of words; sensory aphasia. Three clinical forms of amnesia are recognized, viz., simple loss of memory for words; word-blindness, or inability to comprehend written or printed words; and word deafness, loss of power to understand spoken words. Senile changes, injuries or tumors of the brain, some insanities, and even fatigue or the exhaustion of disease may cause amnesia. See APHASIA.

AM'NESTY (Gk. *ἀμνηστία*, *amnēstia*, forgetfulness, from Gk. *ἀ*, *a*, priv. + *μνᾶσθαι*, *mnasthai*, to remember). An act of State granting oblivion for past offenses, and generally employed where pardon (q.v.) is extended to whole classes or communities instead of to individuals before

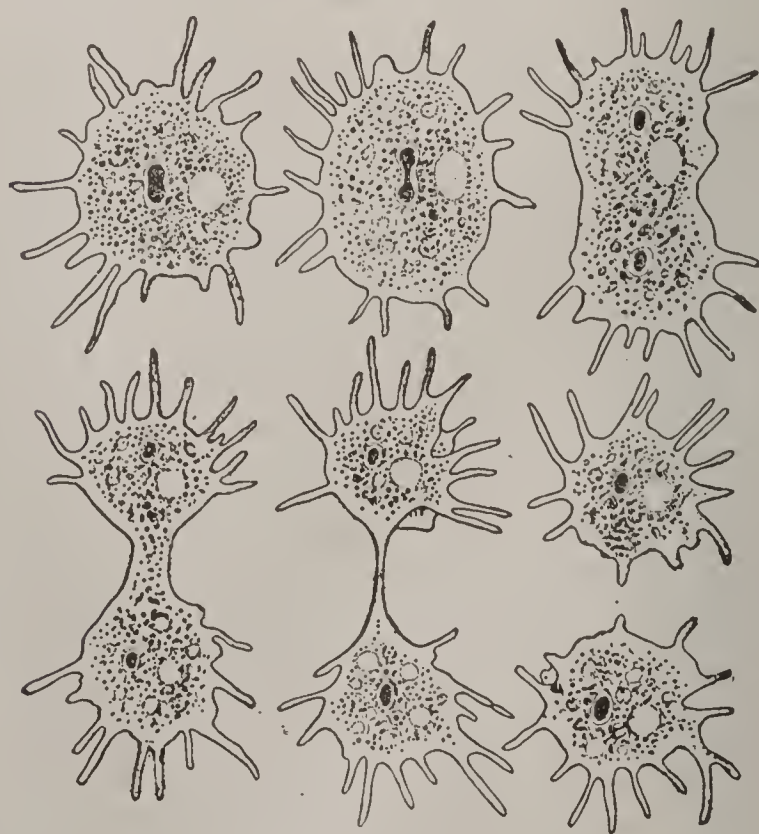
trial and conviction. The President may grant amnesty by a general proclamation for offenses against the United States, except in cases of impeachment; and the Supreme Court has held that Congress also may pass acts of general amnesty. (Brown vs. Walker, 161 U. S. 591, 1895.)

AMNESTY PROCLAMATION. An executive order issued by President Johnson, May 29, 1865, defining in exact legal form, and to some extent narrowing, the terms of general pardon granted by President Lincoln in 1863 to Confederates who took the oath of allegiance to the Constitution of the United States. Although several classes of men were especially excepted from this amnesty, the free use of the pardoning power by the President prevented proscriptions. In 1872 Congress passed an amnesty act of the broadest scope, pardoning practically every one who had taken part in the Civil War against the United States.

AM'NION (Gk. *ἀμνιον*). The membrane which immediately invests the embryo, appearing very early in the development of the latter and adhering closely to it. As gestation proceeds, this membrane secretes from its inner surface a fluid which separates it from the fœtus. This fluid, the *liquor amnii*, supports and at the same time gives free movement to the fœtus, preserves it from injury, and maintains around it an equable temperature; and later, during labor, becomes, with its inclosing membranes, an important dilator of the genital canal. See EMBRYOLOGY; CAUL.

AM'NIO'TA. See EMBRYOLOGY.

AMŒ'BA (Neo-Lat.; Gk. *ἀμοιβή*, *amoibē*, change, alternation). A microscopic animalcule or single-celled organism, classified among the lowest Protozoa, which inhabits fresh water or occasionally moist earth. It appears in water under great magnification as a clear, translu-



AMŒBA.

Beginning at the upper left-hand figure, the successive drawings show the progress of a division of an amœba through its nucleus into two.

cent, highly refracting body. It is made up of a substance that does not mix with water, is viscid like glue, and has a specific gravity a little greater than water, namely, about 1.015. Under the highest power of the microscope, particularly after death, the body is seen not

to be perfectly homogeneous, but to be made up of films inclosing water-filled spaces. This structure may be imitated by making a fine mixture of oil and potassium carbonate and letting it stand in water. The potassium carbonate is hygroscopic, and eventually an emulsion is produced in which the oil stands to the water in the same relation that the protoplasmic films do to the water spaces. The cytoplasm is not all of the same kind. Near the centre is a specialized portion known as the nucleus, the protoplasm outside of which is called cytoplasm. Between nucleus and cytoplasm a constant interchange of material is taking place in the living cell, and the two parts are interdependent.

A living amœba under appropriate conditions exhibits a continual movement of the protoplasm. The very structure favors a constant movement, as witness the artificial emulsion, whose outline is constantly changing. In amœba processes (pseudopodia) are thrust out at certain points of the body, and others behind them are retracted, and thus a change occurs in the centre of the mass and locomotion is effected. Amœba is irritable, i.e., it is affected in a definite manner by external conditions; it "responds" to them by moving with reference to them. Without a stimulus there would probably be no movement at all. If the stimulus comes upon the organism from one side, it may move toward or from that side. Thus the amœba moves from the point of contact of a needle or from the source of light, or it moves so as to keep in water of a medium temperature. Thus we see that protoplasm early had the capacity of appreciating external conditions and moving with reference to them.

The amœba is, by its movements, constantly expending energy. Also, its plasma is undergoing constant destruction and must be reformed. Food here serves two purposes: (1) it serves as fuel; (2) it forms new protoplasm. There is no proper oral aperture, and the food is merely taken into the interior of the body by a process of intussusception—any portion of the surface being chosen for this purpose, and acting as an extemporaneous mouth. Sometimes the ingestion of food takes place chiefly at the posterior end of the body. When the particle of food has been received into the body, the aperture by which it was admitted again closes up, and the discharge of solid excreta is effected in an exactly similar but reverse manner. Food stuffs that are ingested become dissolved (digested) and penetrate the plasma films. Here they are burned (oxidized) and carbon dioxide, water, urea, and other substances are produced. These get back into the water spaces and are finally thrown out with the "contractile vacuole." This process is excretion. But in the plasma film, where the food stuff was burned, there is an increase of temperature. This heat is used in part in chemical work—in the building up of new living molecules from food stuffs. Here, then, is a great chemical laboratory in the protoplasm.

"The 'contractile vesicles' are cavities within the endosarc, of which ordinarily only one is present in the same individual, though there may be two or more. In position, the contractile vesicle, or 'pulsating vacuole,' as it is often called, is usually placed toward the hinder end of the body, as is also the nucleus."

Reproduction takes place by simple division,

each amœba, as it reaches maximum size, splitting in two, as shown in the illustration. See CELL; PROTOZOA.

AMŒBE'AN VERSES (Gk. ἀμοιβαῖος, *amoi-baios*, responsive, alternate). A species of pastoral poetry in which two persons answer each other alternately, as in some of the *Idyls* of Theocritus, the third, fifth, and seventh *Eelques* of Vergil, the ninth ode of the third book of Horace's *Odes*, and in Catullus, 62. The first singer might select any theme and any form of verse; he might vary the theme at will. The other was bound to answer on the same or a kindred theme, to employ the same form of verse and the same number of verses, and yet in force and spirit to outdo the first. Poems of this sort presuppose skill in improvisation.

AMOL, à-mōl'. A Persian town, in the province of Mazanderan, situated on both banks of the Heraz, a short distance from its fall into the Caspian Sea (Map: Persia, D 3). It contains fine bazaars and a number of ruins and old tombs, including that of Mir Bursuk, who died in Amol in 1378, and whose memory is held in great reverence by the natives. Pop., about 10,000.

AMOLE, à-mō'lâ. The Mexican name for soapwort (q.v.).

AMO'MUM (Lat. Gk. ἄμωμον, *amōmon*, an Indian spice-plant). A genus of about 55 species belonging to the family Zingiberaceæ, and natives of Asia, Africa, and Australia. Among them is the plant yielding cardamom and grains of paradise (q.v.).

AM'ON. A King of Judah (c.639–637 B.C.), son of Manasseh. After a short reign he fell a victim to a court intrigue. His death was avenged, and his son Josiah succeeded him on the throne. He was buried in the garden of Uzzah.

AMONTONS, à'môn'tôn', GUILLAUME (1663–1705). A French physicist and inventor. He devoted himself to physical research, investigating the phenomena of friction and perfecting many instruments used in experimental philosophy. With the aid of the barometer he studied the variations of atmospheric pressure and, by the use of a thermometer of his own invention, discovered independently, though simultaneously with Halley, that the boiling point of water varies with the external pressure of the atmosphere and hence with the elevation. He also invented an ingenious method of telegraphic communication, a new hygrometer, etc. He wrote *Remarques et expériences physiques sur la construction d'une nouvelle clepsydre, sur les baromètres, les thermomètres, et les hygromètres* (1695), besides contributions to the *Mémoires* of the Académie des Sciences.

AMORES. See OVID.

AM'ORET. In Fletcher's *Faithful Shepherdess* (q.v.), a shepherdess betrothed to Perigot at the "Virtuous Well" and after many troubles, patiently borne, united to him.

A'MORET, or **AMORET'TA**. In Spenser's *Faerie Queene*, the twin sister of Belphœbe (q.v.), brought up by Venus and Psyche. She loves Sir Scudamore, but is imprisoned by the enchanter Busirane; in the end, however, she is happily married, appearing as the type of feminine affection.

AMORETTI, à'mō-rēt'tê, CARLO (1741–1816). An Italian naturalist and author. He was born near Genoa and died at Milan. He was a member of the order of St. Augustine, professor

of law at the University of Parma, and afterward curator of the Ambrosian Library at Milan. He is remembered chiefly for a good biography of Leonardo da Vinci (1784), and various treatises on natural science, including a study of the natural history and geography of lakes Como, Maggiore, and Lugano, entitled *A Journey from Milan to the Three Lakes* (1794).

AMORGOS, à-môr'gôs (Gk. Ἀμοργός). The most easterly island of the Cyclades, Greece, having an area of 52 square miles, with its greatest length from northeast to southwest (Map: Greece, G 5). The island is crossed by a mountain range and yields olive oil, wine, fruit, and grain. Its chief town is Korax, or Chora, on the eastern coast. Amorgos was famous in antiquity for the fine quality of its flax. Pop., 1907, 2627. Consult H. Hautteœur. "L'île d'Amorgos," in *Bulletin de la Société royale belge de géographie*, vol. xxiii (Brussels, 1899), and J. Delamarre, "Amorgos," in *La Revue de Philologie*, vol. xxv (Paris, 1901).

AMORITES (Heb. *amorim*, Bab. *amurru*, Eg. 'mr, probably *amur*). The name of a Semitic people in Syria and Babylonia. From the earliest times the inhabitants of Babylonia seem to have designated Syria as "the land of the Amorites." Lugalzaggisi of Erech, Sargon of Akkad, Gudea of Lagash, Gimil Sin of Ur, and the Elamitish King Kudur Mabuk speak of their expeditions against this country. It was chiefly northern Syria, including the Phœnician coast, that was reached by these raids. In the Amarna letters this district is also described as the land of the Amorites. Abd Ashirat and his son Aziru, who caused so much trouble to the Egyptian governors, were Amorites. From the tablets found by Winckler at Boghazkui in Asia Minor, the ancient capital of the Hittite Empire, we know that Aziru, "king of the land of Amurru," was able to leave his throne to a line of descendants, Temen Teshub, Abi Teshub, and Bentashina, who ruled under Hittite suzerainty, in the city of Amur, probably Kadesh on the Orontes. Bentashina even made raids into Babylonia so far as the city of Akkad (see ACCAD), for which complaint is lodged with his over-lord, Hattushil. (See HITTITES.) The Egyptian inscriptions of Seti I, Rameses II, and Rameses III inform us of the causes that led to the overthrow of the dynasty founded by Aziru. It went down before the attacks of the Peoples of the Sea. The Egyptian sovereignty which Aziru had exchanged for the Hittite was probably imposed on the Amorites as a result of the numerous campaigns waged against the powerful prince of Kadesh by Thothmes III (1501-1447 B.C.) in the land of Amur. The Assyrian kings Tiglath-Pileser I, Adadnirari III, Sargon II, and Sennacherib use as terms to denote Syria "the land of the Amorites" and "the land of the Hittites." According to Genesis xiv. there were Amorites in Hebron and Hazazon-Tamar (i.e., Engeddi) in the days of Amraphel and Abraham (c.2100 B.C.). At the time of the Hebrew invasion there were two Amoritish kingdoms east of the Jordan, those of Og in Bashan and Sihon in Heshbon, which were conquered (Num. xxi. 21 ff.). To the latter an old song refers which may go back to the time of the conquest (Num. xxi. 27-30). Amoritish city-kingdoms also existed in the West Jordan country against which the invaders fought, many of them succumbing only in the reign of David. They were gradually absorbed in Israel and Judah and are referred to in later times only as a

people of the past that once possessed the land, along with Canaanites and others (c.g., Amos ii. 9, 10). The proper name of the chief god of the Amorites was Amur, and his consort was Ashirat.

Amorites also formed an element of the population of Babylonia. In fact, the first Babylonian dynasty, whose most famous king was Hammurapi (q.v.), was Amoritish. Many of the officials were Amorites. There was a secretary of the Amorites, as there was one of the Aramæans. Names compounded with that of their great god Amur are frequent, and men and women of "the children of the Amorite" appear in a contract. Whether these Amorites invaded Babylonia from the desert or came from Syria cannot yet be determined. Clay maintains that they brought from Syria to Babylon a high civilization. This is not capable of proof. But it is significant that the most powerful and brilliant of early Babylonian dynasties was Amoritish. Until recently the Amorites were known only through casual references to them in the Old Testament. The Hebrews themselves knew little of their early history. In the light of recent discoveries they are seen to have played a very important part in history. The old etymologies of their name 'the highlanders,' 'the tall ones,' have no value. Consult: Ed Meyer, *Geschichte des Altertums* (2d ed., 1909); Clay, *Amurru, the Home of the Northern Semites* (1909); Schmidt, *Messages of the Poets*, pp. 320 ff. (1911); Böhl, *Kanaaner und Hebräer*, pp. 31 ff. (1911). See ARABIC LANGUAGE AND LITERATURE.

AM'OROUS BIG'OT, THE. A play by Thomas Shadwell, presented in 1690.

AMOR'PHA. See INDIGO.

AMOR'TIZA'TION. The charging off or redeeming of capital investment in a plant or mine during the life of the property. Dividends on investments of limited life, such as mines, should be considered as interest on the investment plus the return of capital. When the dividends from a mine investment amount to 10 per cent, the life of the property must be 17.7 years to return the capital and 6 per cent interest on the investment providing the remaining 4 per cent of dividend is invested as received at 4 per cent interest. A dividend of 15 per cent when subdivided into 7 per cent income from investment and 8 per cent as return of capital requires, when the 8 per cent is reinvested at 4 per cent interest, 10.3 years for the entire return of the original investment.

A'MORY, BLANCHE. A character in Thackeray's *Pendennis* (q.v.), really named Betsy; an insincere and selfish girl, whose emotions are all shams.

AMORY, ROBERT (1842-1910). An American physician. He was born in Boston and studied medicine at Harvard and later in Paris and in Dublin. In 1869 he was made lecturer at Harvard College on the physiological action of drugs. He was also for some time professor of physiology at the Bowdoin Medical School. Besides a translation from the German of Russ's *Lectures on Physiology* (1875), Dr. Amory published a number of interesting papers on the physiological action of various chemical substances. He also wrote a volume on poisons, forming part of Wharton and Stillé's *Medical Jurisprudence*.

AMORY, THOMAS (1691?-1788). An Irish author, called the "English Rabelais," and supposed by certain authorities to have been slightly

insane. He was the son of Counselor Amory, who was appointed by William III secretary for the foreign estates in Ireland. His birthplace is not known, but in 1757 he was living in seclusion in Westminster. It is supposed that he sketched portions of his own career in his *Life of John Bunce* (2 vols., 1756-66), which is a literary curiosity. A sketch of his life appeared in the *Saturday Review*, May 12, 1877.

AMORY, THOMAS COFFIN (1812-89). An American lawyer and author. He was born in Boston, Mass., and after graduating at Harvard (1830) held various posts in connection with the municipal government of Boston, and served in the State Legislature. In addition to official reports and addresses, his publications include the *Life of James Sullivan* (Boston, 1859); *Military Services and Public Life of Major-General John Sullivan* (Boston, 1868); *The Transfer of Erin, or The Acquisition of Ireland by England* (1877); pamphlets on subjects connected with the Revolutionary War, among which was a *Life of Sir Isaac Coffin* (1886), and numerous poems, of which the best known is *William Blackstone, Sole Inhabitant of Boston* (2d ed., 1877).

AMOS. A Hebrew prophet of the eighth century B.C., author of the biblical book which bears his name. According to his own statement he was not a prophet by profession, but a herdsman and tender of sycamore trees (i. 1; vii. 14). His home was at Tekoa, but it is not certain whether this place is in Judah, near Bethlehem, or in Israel. He prophesied during the reigns of Uzziah in Judah and Jeroboam II in Israel (about 750 B.C.). In a discourse at Bethel he denounced the moral delinquencies and foretold the punishment, first of several surrounding nations including Judah, then of Israel itself, on account of the various sins which had brought the anger of Yahwe upon the kingdom. For this he was taken severely to task by Amaziah, who charged him with delivering his oracles for money and asked him to go elsewhere and prophesy, which only brought upon the head of the chief priest at Bethel a still fiercer denunciation. The style of Amos is remarkable for its clearness and picturesque vigor and abounds with images taken from rural and pastoral life. While Amos is the first of the prophets who wrote as well as spoke, the editing of his prophecies belongs to a period long subsequent to his death. Hence modern critics have detected in them numerous additions, insertions, and changes, made by various hands. Amos ix. 8-15 seems very clearly to point to the exile, when the tent of David, i.e., the Davidic dynasty, had fallen, and the people were in special need of encouragement. For recent discussions of the problems involved, consult G. A. Smith, "The Twelve Prophets" in *The Expositor's Bible*, vol. i (New York, 1896-97); H. G. Mitchell, *Amos* (Boston, 1899); Driver, *Joel and Amos* (1897); the commentaries of Nowack (1903); Marti (1904); and W. R. Harper, *Amos and Hosea* (1905).

AMOS JUDD. A skillful story by J. A. Mitchell (q.v.) of Hindu mysticism in New England surroundings.

AMOSKEAG, ăm'ôs-kĕg'. See MANCHESTER, NEW HAMPSHIRE.

AMOUR, L'. A novel by the famous French historian Jules Michelet (q.v.), published in 1859, when he was 61 years of age. It is devoted to the ideal of the family.

AMOY, à-moi' (the local pronunciation of *Hai-mun*, or Gallery Gate). A Chinese city at the southern end of the island of the same name, in lat. 24° 28' N., long. 118° 4' E., in the province of Fukien (Map: China, E 7). The island of Haimun is 40 miles in circumference. It is opposite the centre of the island of Formosa, with which it carries on considerable trade. Its harbor is a fine one, and much of the trade to Chang-chu-fu on the Pei-chi (Dragon) River, at the mouth of which Amoy is situated, passes through this port. Amoy is the ancient centre of the tea trade. The Portuguese came here in 1644, but were expelled for their cruelty. The English traded here until 1730, when they were ordered to remove to Canton. Nearly all the tea brought to Boston harbor by the British ships in 1773 was from Amoy, in the neighborhood of which it was grown. All the tea now exported to the United States from Amoy is grown in Formosa and sent here for reshipment. Even this trade is being gradually lost since the harbor at Kelung, Formosa, has been deepened, and it is expected that it will be entirely ruined when the harbor improvements at Kelung and at Tamsui shall have been completed. The British treaty of 1842 made Amoy one of the five ports opened to foreign commerce, and the treaty of Tien-tsin in 1858 confirmed and extended the privilege. Amoy has long been the centre of flourishing Christian missions in Fukien. In 1882 a British engineer discovered coal and iron within 40 miles of Amoy, in an area of 50 square miles and within 20 miles of water traffic. The harbor is large, safe, and picturesque. There are three granite docks built by foreigners, an English church and club, and a daily newspaper. One hundred thousand emigrants pass through Amoy every year to Singapore, and about 25 per cent of those who leave the port do not return. It is estimated that over 2,500,000 of Amoy people were abroad in 1905. Four-fifths of the families have some members abroad, but for whose remittances the distress would be terrible. Pop., 1911, 114,000.

AM'PELIDA'CEÆ. See VITACEÆ.

AMPELIUS, LUCIUS. A Roman writer, who lived between the second and fourth centuries A.D. He was the author of a note-book, *Liber Memorialis*, which contained, in 50 chapters, a condensed and meagre summary of various astronomical, geographical, mythological, and historical writings. The *Liber* is, for the most part, too inaccurate for use as a work of reference, but it is valuable as the only ancient work which mentions the celebrated sculptures of Pergamus, discovered in 1878 and now at Berlin (see PERGAMON). It is usually appended to editions of Florus, and has been edited with notes by Beck (Leipzig, 1826). The best text is that of Wölfflin (Leipzig, 1853).

AM'PELOP'SIS (Gk. ἄμπελος, *ampelos*, vine + ὄψις, *opsis*, appearance). A genus of vine-like, woody plants much used for ornamental decoration of buildings. It includes the Virginia creeper, or American woodbine, and the Japanese ivy or Boston ivy, which is probably the favorite of all the hardy vines grown in cities in the eastern United States. It is especially effective for a considerable area from Massachusetts to Florida and on the Pacific coast, but north of the Ohio and west of the Mississippi River it is tender. In autumn the dying leaves of ampelopsis turn a most brilliant red and yellow. A single fossil species of this genus,

Ampelopsis tertiaria, has been recognized in the White River beds of the Tertiary in Wyoming.

AMPERE, ăm-pâr' (derived from the name of Ampère). The practical unit employed in measuring the intensity of an electric current, and technically defined as one-tenth of the C.G.S. electromagnetic unit (see ELECTRICAL UNITS) of current. By intensity of current is meant the quantity of electricity which passes any cross section of the wire or conductor in the course of one second of time. The current depends upon the resistance of, and the difference of potential at the ends of, the conductor, varying inversely as the former and directly as the latter. From Ohm's law that $C = \frac{E}{R}$, when C is

the current, E the difference of potential, and R the resistance, we have amperes = $\frac{\text{volts}}{\text{ohms}}$. A

current of electricity can do work in decomposing certain chemical substances into their respective elements; consequently, by measuring the amount of a substance so decomposed in unit time, we can ascertain the strength of the current. The ampere, accordingly, was defined by the London Conference of 1908 as the amount of a constant current which, when passed through a solution of nitrate of silver, in accordance with standard specifications, deposits silver at the rate of 0.001118 of a gram per second. The instrument used in such a determination is called a "silver voltameter" (q.v.). Within the past few years it has been proved that the quantity of silver deposited in a voltameter depends upon many conditions previously unsuspected, such as the age of the solution, the construction of the voltameter, etc. For full details as to our present knowledge of the subject, the reader should consult the *Bulletins* of the Bureau of Standards, Washington, D. C.

AMPÈRE', ăm-pâr', ANDRÉ MARIE (1775-1836). A distinguished French physicist, mathematician, and naturalist, born at Lyons. The death of his father under the guillotine in 1793 made a deep and melancholy impression on the mind of the young man, and he sought solace in the study of nature and the Latin poets. In 1801, after he had been engaged for some time as private mathematical tutor at Lyons, he became professor of physics in the Central School of the department of Ain at Bourg. He was afterward professor of mathematics at Lyons. He was called to Paris, where he distinguished himself as an able teacher in the Polytechnic School. He began his career as an author by the essay on the mathematical theory of chances, *Sur la théorie mathématique du jeu* (Lyons, 1802). In 1814 he was elected a member of the Academy of Sciences and in 1824 was appointed professor of experimental physics in the Collège de France. Science is largely indebted to Ampère, especially for his electro-dynamic theory and his original views of the identity of electricity and magnetism, as given in his *Recueil d'observations électro-dynamiques* (Paris, 1822) and his *Théorie des phénomènes électro-dynamiques* (Paris, 1826). Ampère was the inventor of the astatic needle (q.v.), which made possible the modern astatic galvanometer (q.v.). He was the first to show that two parallel conductors carrying currents traveling in the same direction attract each other, while if traveling in opposite directions they repel each other. Am-

père also formulated the theory that there were currents of electricity circulating in the earth in the direction of its diurnal revolution which attracted the magnetic needle. The ampere (q.v.), or unit of the strength of an electrical current, is named after him. Ampère's scientific papers are largely contained in the *Annales de Physique et de Chimie*. A eulogy by Arago, delivered shortly after his death, which contains an account of his life, will be found translated into English in the annual report of the Smithsonian Institution for 1872 (Washington, 1872).

AMPÈRE, än'pâr', JEAN JACQUES ANTOINE (1800-64). A French academician, essayist, literary historian, and professor in the Collège de France. He was born at Lyons, the son of André Marie Ampère. His essays, collected as *Littérature et voyages* (2 vols., 1834), attest his knowledge of foreign countries and their literatures. Better known are the essays on the formation of the French language, *Histoire de la formation de la langue française* (1841) and *La Grèce, Rome et Dante* (1850). Ampère was a judicious critic, a profound scholar, and master of a precise style. Consult Pottou, *Etudes sur la vie et les travaux de Jean Jacques Ampère* (Paris, 1867); while notices of him are found in Sainte-Beuve's *Portraits Littéraires*, vol. iv, and in *Nouveaux Lundis*, vol. xiii.

AMPERE, ăm-pâr', **TURNS**. In problems involving the magnetic field produced by a current flowing in a coil of wire, two of the factors necessary are the strength of current in amperes, and the number of turns or revolutions that the conductor through which the current passes makes in forming the coil or solenoid. Their product is known as the ampere turns.

AM'PHIARA'US (Gk. Ἄμφιαραός, *Amphiaraios*). A Greek chthonic divinity. At Oropus he had a celebrated oracle, healed the sick, and was honored with games. He was worshiped elsewhere also as a hero and prophet. In legend Amphiaraius is prominent in the war of the Seven against Thebes, into which he was forced by the treachery of his wife, Eriphyle, who was bribed by Polynices. As he fled from the victorious Thebans, Zeus caused the earth to open and engulf him with his horses and chariot. He was a descendant of the seer Melampus, and son of Oicles and Hypermetra. According to later writers, he took part in the Calydonian hunt and the Argonautic expedition. See ADRASTUS; ÆSCHYLUS; ETEOCLES AND POLYNICES; SEVEN AGAINST THEBES.

AMPHIB'IA (Gk. ἀμφί, *amphi*, on both sides + βίος, *bios*, life). A class of vertebrates intermediate between fishes and reptiles. It was made by Linnaeus to comprise reptiles, amphibia, and cartilaginous fishes, but has been restricted, until now it is equivalent to Batrachia, and includes frogs, toads, newts, salamanders, the snake-like Gymnophiona and gigantic extinct forms, the Stegocephali. As adults, many, but not all of them, are able, either by the possession of lungs or by means of skin respiration, to come from water to land; hence their name.

Distinctive Characteristics. All the free-developing amphibia possess gills in the larval stage that, in some forms, persist throughout life. The skin is soft and glandular and serves in part or wholly to aerate the blood. The outer layers of the skin become cornified and are periodically shed, and in a few cases there is a bony dermal skeleton. The paired fins of fishes are replaced by pentadactyl legs. In some forms, as in sirens, one pair of limbs may be wanting,

and in such forms as *Gymnophiona* both pairs may be lacking. The mouth is terminal, and the teeth are firmly ankylosed to the supporting bones. The tongue, when present, is bifid and is so fixed at the front of the mouth that the free end turns backward. The mouth and pharynx are ciliated and into them open the internal nares. The alimentary tract is nearly straight in the elongated forms, or it may be much convoluted, as in the case of vegetable-feeding tadpoles. There are a two-lobed liver and a pancreas. The lungs are thin-walled sacks that may have internal folds, but some salamanders are lungless. The heart is usually composed of two distinct auricles, one ventricle, and a conus arteriosus. The red blood corpuscles are oval, nucleated, and large in comparison with those of warm-blooded vertebrates.

Breeding Habits. The eggs may be fertilized internally or externally, just as they are being deposited in the water. In most cases they are left to chance, but in some species are carried in strands, or otherwise cared for by the male or female. A few have brood pouches, and one toad rears its young in pits in the skin of the back. A few forms bring forth their young in an active condition. The gill-bearing or larval stage (axolotl) of *Amblystoma tigrinum* is capable of breeding, and under certain conditions may undergo its metamorphoses. (See AXOLOTL.) The eggs are pigmented and usually undergo total and unequal segmentation. They possess a large amount of yolk, so much in a few cases, such as pipa, that the embryo lies coiled over the egg as though it were a fish. The blastula and gastrula stages are present, but are modified in form and manner of development by the presence of the yolk; the medullary groove develops by a pair of upfoldings along the middle of the back, and by fusion of head and body the tail becomes marked off; on the neck are two or three pairs of external gills. At about this time the tadpoles hatch and begin to swim about or adhere to weeds by means of the sucker on the ventral surface of the head. At first the tadpole has no mouth, but soon one develops; the external gills dwindle and are replaced by the internal, which are covered by a fold of skin. The hind limbs are the first to appear externally, lungs develop, and the larva can breathe both on land and in water. The gills of the Anura continue to dwindle, and likewise the tail is gradually and completely absorbed. Tadpoles as well as some adult amphibia have the power of reproducing lost parts. See TOAD.

The early stages of amphibians are not always passed in water. Some of the European salamanders are viviparous, the young being born all developed, but still requiring water. The young of the viviparous *Cæcilidæ*, however, take to a terrestrial life as soon as they are born. So, too, certain frogs (e.g., *Rana opisthodon*, of the Solomon Islands) hatch from eggs laid out of the water as perfect, air-breathing frogs. In many species, as in the persistent gilled Urodela, the adult lives chiefly in the water; in other cases, as in the other Urodela, the *Cæciliidæ*, and the Anura, the adult lives on land.

Habits. The adult Amphibia feed on worms, slugs, and insects. Hence they are all useful to agriculture. None has a poisonous bite, but all trust largely for safety to acrid or poisonous secretions from the skin glands. The tadpoles subsist almost entirely on water vegetation, such as algæ. In cold or dry seasons Amphibia pre-

serve themselves by burrowing down into mud and earth, and there fall into a lethargic sleep. Most Amphibia keep near water, and their young develop in it. A few forms that live in mountains, in trees, or on dry, porous volcanic islands, bring forth their young well enough developed to breathe air, thus approaching a reptilian condition of development. Many, but not all, amphibians are nocturnal, being most active in their search for food or mates in the early morning or evening hours.

Geographical Distribution. The amphibia thrive best in warm and moist countries. A few live in the temperate zone, some frogs penetrating far north, but not so far as the polar regions. The order of relative abundance of amphibia in the different countries is as follows: Tropical America, India, Africa, Australia, North America, Europe. Many families and genera have a very limited range, since, although fresh water is a necessity to them, the sea is a complete barrier to their spread. Salamanders are confined mainly to Europe and North America, and only toads and frogs are of world-wide distribution.

Classification. There are four orders of Amphibia: the Urodela, possessing a tail throughout life (newts and salamanders); the Anura, without tail in the adult stage (frogs and toads); the *Gymnophiona*, snake-like, without limbs, and blind, and the *Stegocephalia*, and other extinct often gigantic tailed forms fossil in the Carboniferous, Permian, and Trias rocks. The existing species number about 1000.

Ancestry. The Amphibia have doubtless sprung from fish-like ancestors, and the link with that ancestry is found in the fossil group of *Stegocephalia*, whose head carries great plates. The piscine group from which the Amphibia arose must have been either the Dipnoi, which are to-day largely air-breathers, or the *Crossopterygii*. Gadow, in 1901, gave the following features of Amphibia as those that proclaim their piscine descent: (1) the possession by the heart of a long conus arteriosus (anterior to the ventricle) provided with, in many cases, numerous valves, on at least (in Anura) one series at the base, another at the beginning of the truncus where the arches branch off; (2) the strictly symmetrical arrangement of these arches; (3) the three-chambered heart is still like that of Dipnoi; (4) the occurrence of as many as four or even five branchial skeletal arches in the larval stage; (5) the glottis (or entrance to windpipe) is supported by cartilages which themselves are derivatives of posterior visceral arches; (6) the development (in Urodela as in *Stegocephalia*) of the vertebræ from four pairs of elements called arcualia, and the formation of the intervertebral joints by a split across the intervertebral ring of cartilage; (7) the hypoglossal nerve still lies outside and behind the skull as a cranial nerve; (8) the presence of lateral sense organs; (9) the possession of external gills, as in Dipnoi and *Crossopterygii*. It is frequently assumed that the first Urodela were aquatic creatures, provided with a finned tail and small lungs. Gadow believes these to be larval acquisitions, not ancestral reminiscences. The fact that the ancestors of Amphibia evolved the pentadactyl condition proves that they were land animals. The evolutionary change through which the early Amphibia passes are thus enumerated by Gadow.

1. "Terrestrial, with two pairs of pentadac-

tyloid limbs; breathing by lungs only; with a fully developed apparatus of five pairs of gill arches, which during the embryonic life perhaps still carried internal gills, with or without several pairs of gill elefts. Reduction of the dermal armor and of the eutaneous scutes had taken place.

2. "Additional respiratory organs were developed by the embryo, in the shape of external gills; these were at first restricted to embryonic life (as in the existing Apoda), but were gradually used also during the aquatic life of the larva. These external gills, together with the lungs, have superseded the internal gills, of which there are now no traces either in Urodela or in Anura.

3. "Some Urodela, retaking to aquatic life, retained and further enlarged the external gills into more or less permanent organs. The majority of Urodela hurry through the larval, aquatic stage, and some—e.g., *Salamandra atra*—became absolutely terrestrial. The possession of unusually long external gills by this species and by the Apoda indicates that these organs are essentially embryonic, not larval, features."

Bibliography. The foremost systematic writers upon this group are G. A. Boulenger, of the British Museum, and E. D. Cope. The latter has completely monographed North American forms in "Batrachia of North America," *Bulletin 34, United States National Museum* (Washington, 1889). This discusses the larger relations of the group and gives an extensive bibliography. For a still more recent general treatise consult H. Gadow, "Amphibia," *Cambridge Natural History*, vol. viii (Cambridge, 1901), and "Amphibia," by Lydekker, Cunningham, Boulenger, and Thompson (London, 1912). For a more popular treatment, consult Dickerson, *The Frog Book* (New York, 1906). See ALIMENTARY SYSTEM (*Evolution of*) and similar articles relating to comparative anatomy.

AMPHIBIA, FOSSIL. See STEGOCEPHALIA.

AMPHIBIOUS PLANTS. Plants that are able to thrive either with their leaves submerged or completely exposed to the air (see also AQUATIC PLANTS). In some plants both air and water leaves are of the same size and form, but in other instances they exhibit striking differences of structure. Often, as in the mermaid weed (*Proserpinaca palustris*), or in one of the watercresses (*Radicula aquatica*), the water leaves are finely dissected; but the forms produced in the air are quite entire. The water buttercups, *Ranunculus multifidus* and *R. aquatilis*, show similar variations. Some of the arrowheads, like *Sagittaria heterophylla*, produce early in the season narrow grass-like leaves quite below the surface of the water, but somewhat later the leaves emerge from the water and have broad arrow-shaped blades. In other cases, like that of the water smartweed (*Polygonum amphibium*), the principal difference between the water and the air forms is in the entire absence of hairs from the aquatic form and the decided pubescence of the aerial foliage. The causes of these variations in the leaves of amphibious plants are not fully known, but it has been demonstrated that transpiration is one of the most important factors.

AMPHIBOLE (Gk. ἀμφίβολος, *amphibolos*, doubtful, ambiguous; alluding to its being easily confounded with augite). An important group of rock-making minerals closely allied to the pyroxene (q.v.) group. The amphiboles are

metasilicates, principally of calcium, magnesium, or iron, and sometimes also of manganese, sodium, and potassium. The group is subdivided according to the forms of crystallization. Those that crystallize in the orthorhombic system include anthophyllite and its variety Gedrite; the monoclinic section includes the typical mineral amphibole with its varieties, as well as glaucophane, erocidolite, and certain other minerals; while the triclinic section includes anigmatite. All of these minerals have a common prismatic cleavage of from 54° to 56° and also agree in their optical characters and chemical composition.

The most important member of the group is the mineral amphibole, which gives its name to the series. The several varieties of amphibole are divided into two groups, according as they do or do not contain aluminum. The non-aluminous varieties include tremolite, a calcium magnesium silicate that is usually white to dark gray in color, and is found both in crystals and massive; actinolite, a calcium magnesium and iron silicate of varying shades of green; grünerite, an iron silicate which is of a brown color that occurs in fibrous masses. The aluminous varieties include the several varieties of hornblende, which comprises the dark green and black varieties, known as common hornblende (black), pargasite (green and blue), and edenite (white, gray, and pale green). These minerals are found in crystalline metamorphic limestones, granitic, and schistose rocks, and in volcanic or igneous rocks. Nearly every member of the group has several varieties, each of which, besides having a separate name, differs from the type by some slight variation in color, optical properties, or chemical composition. Many varieties of amphibole have been cut as gem-stones.

AMPHIBOLITE. A group of metamorphic rocks characterized by the presence of amphibole (q.v.) in large amount and by a more or less marked foliation or parallel arrangement of the constituents. According to the nature of the amphibole, and to some extent dependent upon the associated minerals, several varieties of amphibolite may be distinguished, such as actinolite-schist, tremolite-schist, glaucophane-schist, and hornblende-schist, which are the more common ones. The name "hornblende-schist" properly belongs to the variety having the common iron-alumina amphibole, but is sometimes used by petrographers in a larger sense as practically synonymous with amphibolite. The different members are all hard and rather tough rocks, resistant to rupture except in the case of the very schistose types which may be cleaved quite readily in a single direction. The amphibole is usually developed in blades or prisms, without crystal terminations, arranged in parallel order that simulates the bedded structure of sedimentary rocks. Their grain varies from coarse to fine, the finer sorts being, perhaps, the more common. Their color is white or grayish in the iron-free tremolite-schist, pale to bright green in actinolite-schist, blue when the amphibole belongs to the glaucophane variety, and dark green to black when common hornblende is the chief ingredient. The associated minerals include feldspar, quartz, and mica of chief importance, besides chlorite, garnet, iron oxides, pyrite, and others in moderate to small amounts.

The amphibolites are of secondary origin and may be formed from either igneous or sedimen-

tary rocks, as has been demonstrated in numerous instances. The change involves in either case a thorough rearrangement of the chemical constituents, sometimes with the introduction of new material, and a recrystallization which destroys the fabric or texture of the parent rock. The agencies productive of such transformation are mainly heat and pressure, under conditions that obtain in the deeper parts of the earth's crust. (See METAMORPHISM.) Among igneous rocks the change is more frequent in the case of varieties like gabbro, dolerite, and pyroxenite that contain relatively large amounts of the iron-magnesia minerals, whereas in the feldspathic varieties, like granite, syenite, and diorite, the end result is usually a gneiss. In large bodies of igneous rock it is not uncommon to find that the process of metamorphism has not been complete throughout, but has been more effective on the borders than in the interior; thus may be observed a gradual transition from amphibolite, on the one hand, to a rock which still preserves its original characters. Of sedimentary strata impure limestones and calcareous clays are most liable to conversion into amphibolite under regional metamorphic influences. The development of tremolite and actinolite is often noticeable in limestones, also around the borders of an igneous intrusive.

Amphibolites are quite widely represented in the older geological formations. They occur in the Adirondacks and along the metamorphic belt of the Appalachians, in the Lake Superior region, and various other parts of the world where the rocks have been subjected to shearing and compression incident to the upraising of mountains. Economically they are not of much importance in themselves, although they may inclose important ore-bodies; the productive iron formations of the Lake Superior region include a rock known as grünerite-schist which is allied to actinolite-schist. By alteration under surface influences amphibolites yield hydrated compounds like talc, chlorite, and serpentine. In the western Adirondacks are large bodies of fibrous talc that have been derived mainly from alteration of tremolite-schist.

AMPHICTYON. See AMPHICTYONIC COUNCIL.

AMPHICTYONIC COUNCIL, AMPHICTYONY (from *Amphictyon*; see below). A name given to various confederations of Greek States, but applied usually to a celebrated religious congress of the confederated tribes of ancient Greece, which met twice every year, at Delphi and Thermopylæ. The meetings at Delphi took place in the temple of Apollo, those at Thermopylæ in the temple of Demeter, which was in the village of Anthela. The congress was composed of the deputies of 12 tribes, whose names are given differently in different authors. The list of Æschines (containing but 11 names) is as follows: Thessalians, Bœotians, Dorians, Ionians, Perrhæbians, Magnetes, Locrians, Cætæans, Phthiots, Malians, and Phocians. The twelfth tribe was probably either the Dolopians or the Ænianians. Each tribe sent as delegates two members, who possessed equal authority. Tradition connects the origin of the Amphictyonic Council with Amphictyon, son of Deucalion. We may at least be sure that the institution was one of great antiquity. Its importance declined in the course of time, and by the third century B.C. it had lost much of its old authority. The duties of the Council were primarily religious and were connected with the care of the

temple of Apollo at Delphi and the protection of the holy lands, treasures, and other perquisites of the god. It was also intrusted with the preparation and direction of the Pythian Games. The duty of protecting the property of Apollo carried with it the power to prosecute and punish all who in any way injured the majesty of the god. Thus the Council possessed important judicial rights, and, since it also had power to regulate matters relating to peace and war among the different members of the federation, it in time acquired political importance also. The members bound themselves by an oath not to destroy any city of the Amphictyons or cut off their streams in war or peace; also, if any State should break this oath, to unite in proceeding against and destroying such a State. Such a war was called a Holy War. There were in early times various other amphictyonies, or associations of tribes, among the Greeks, as at Argos, Onchestus, Delos, and elsewhere, but little is known of these. The correct form of the name, which, however, is not found till 380 B.C., is *Amphictiones* and signifies 'Neighbors.' Consult Tittmann, *Ueber den Bund der Amphictyonen* (Leipzig, 1880), and Freeman, *History of Federal Government* (2d ed., London, 1893).

AMPHICTYONY. See AMPHICTYONIC COUNCIL.

AMPHICYON. A slow and clumsy carnivore chiefly of the Miocene horizons; a giant dog in many respects, with teeth which combined the characters found in dogs and bears.

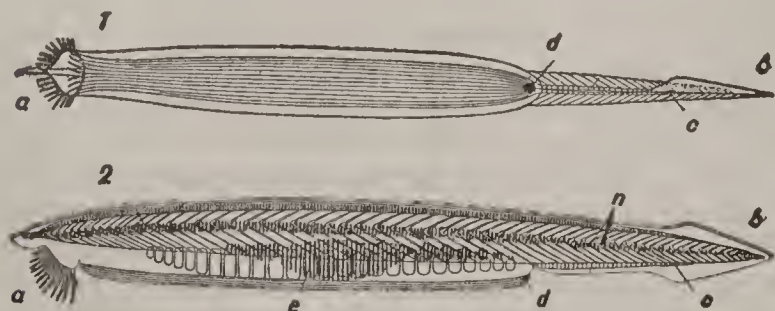
AMPHILOCHUS (Gk. Ἀμφίλοχος, *Amphilochos*). In legend, a son of Amphiaraüs, and, like him, worshiped as a prophet at Oropus and elsewhere; one of the Epigoni, and founder of Amphilocheian Argos in Ambracia. Another group of legends connected Amphilocheus with Cilicia and Pamphylia, whither he was said to have gone after the Trojan War, in which he took part as a suitor of Helen. With Mopsus, he founded Mallus, but later they quarreled and killed each other. Their graves were shown at Mallus, where was also an oracle of Amphilocheus.

AMPHINEURA (Gk. ἀμφί, *amphi*, around + νεῦρον, *neuron*, sinew, nerve). An order of mollusks, characterized by the peculiar arrangement of the nervous system. There are two lateral and two ventral nerve trunks bound together by numerous commissures and provided with ganglion cells throughout their whole length. Anteriorly these cords pass into the cerebral ganglion, which, however, is often hardly more than the upper half of a ring which encircles the œsophagus. The amphineura are bilaterally symmetrical and have the foot somewhat like that of the gastropods. They either have a shell of eight pieces or there is no shell at all. They are all marine forms, chiefly of the warmer seas, and rarely reach a large size. There are two distinct sub-orders, the Polyplacophora, or Chitons (q.v.), and the Aplousophora, or Solenogastres. The latter are degenerate, or are Amphineura whose development has been arrested at an early stage; they are worm-like animals of small size, without a shell, the foot, mantle, and mantle-cavity greatly reduced, and in some forms almost wanting: Only a few recent species are known.

AMPHION (Gk. Ἀμφίων). In mythology, son of Zeus and Antiope, twin brother of Zethus. The story of Antiope and her sons existed in many local forms, but the accepted ver-

sion of later times was found in the *Antiope* of Euripides, of which only fragments have been preserved. Antiope, fleeing from her father, the river-god Asopus, who had threatened to punish her for yielding to Zeus, who had visited her under the form of a satyr, went to King Epopeus, at Sicyon. Dragged thence by her uncle, Lycus of Thebes, she bore the twins on Mount Cithæron, where they were exposed, but found, and reared by a shepherd. Story made Amphion the son of Zeus, Zethus the son of Epopeus. Antiope, cruelly mistreated by Lycus and his wife Dirce, fled to the mountain, and found there her sons. To avenge her wrongs, the twins tied Dirce to the horns of a wild bull, and captured Lycus, who surrendered Thebes, which they fortified. Amphion charmed the stones into place by his lyre. The characters of the brothers are sharply contrasted: Zethus is the rough huntsman, and Amphion is the gentle musician. Amphion and Zethus were honored at Thebes as Dioscuri, as Castor and Pollux were at Sparta. Amphion married Niobe and was killed by Apollo, or committed suicide when his children were killed. The punishment of Dirce is the subject of a celebrated group of statuary—"The Farnese Bull"—by Apollonius and Tauriscus of Tralles, found in the Baths of Caracalla in Rome in 1546 and now in the Naples Museum. It is a work of the early part of the first century B.C., but has been much restored.

AM'PHIOX'US (Gk. *ἀμφί*, *amphi*, at both ends + *ὄξυς*, *oxus*, sharp). A small, bilateral, translucent, marine animal, about two or three inches long, thought by some to be an offshoot of the primitive vertebrate stock, and by others to be a degenerate, primitive vertebrate. The amphioxus, or 'lancelet,' has no well-defined brain, but a persistent and unsegmented notochord. The muscles are arranged in 62 V-shaped myomeres dovetailed into one another. The single mouth and anus are in the median line. There are no limbs, ears, sympathetic nerves, or genital ducts. The gill slits, which are numerous and supported by bars, open from the mouth into the atrial chamber, which has one opening to the exterior, the atrial pore. The best-known species is *Amphioxus lanceolatus*, which dwells



AMPHIOXUS.

1. Ventral view of the entire animal lying on its side. 2. Side view. *a*, anterior end, showing cirri about the hooded mouth; *b*, caudal fin; *c*, anus; *d*, atrial pore or excurrent orifice for the water constantly taken in at the mouth; *e*, generative organs; *n*, notochord.

buried in sand near the seashore line. Its food, which consists mainly of diatoms, is sucked into its mouth. The adults swim about in the evening only, but the young are very active. The segmentation of the egg is complete, and results in the formation of a blastosphere, which invaginates to form a gastrula. The medullary groove is formed by a sinking of the ectoderm along the mid-dorsal line. The cavity of the gastrula becomes the gut of the adult. In the active early life of the embryo the ectoderm is

ciliated. The simplicity of its development has made the amphioxus a favorite object of study for the descriptive and experimental embryologist. If the two cells which are the result of the first segmentation are separated, each cell will develop into a complete individual one-half the size of the normal embryo. Incomplete separation results in the formation of double or Siamese-like twins. Compare *BALANOGLOSSUS*; and consult A. Willey, *Amphioxus and the Ancestry of the Vertebrates* (New York, 1894). See the articles on the evolution of the alimentary, circulatory, muscular, nervous, and respiratory systems, under *ALIMENTARY SYSTEM*, etc.

AMPHIP'ODA (Gk. nom. neut. pl., from *ἀμφί*, *amphi*, around + *πούς*, *pous*, foot). An order of crustaceans, distinguished by the sessile, lateral eyes and the greatly compressed body. They are mostly of small size, and some are very minute. Their name alludes to the peculiar arrangement of the so-called walking-feet, four pairs of which point forward and three backward. The abdomen, or "tail," is also a powerful locomotive organ, and assists the animal in jumping, which is its usual mode of progression. Even in swimming its movements are chiefly a succession of jumps. The amphipods are usually plainly colored, but some forms are very handsome. A large number of species is known, but zoölogists are by no means agreed as to their classification, some making only two and some as many as nine families. They occur in both fresh and salt water and are especially abundant along sandy beaches, where they skip about in such a lively manner that they are called beach-fleas or sand-hoppers. Amphipods are also found living in sponges and jellyfish and as true parasites on the skin of whales. They are widely distributed over the world, occurring even in the Arctic regions, and are of great practical importance as food for fishes. See *BEACH-FLEA*; *CRUSTACEA*.

AMPHIP'OLIS (Gk. *Ἀμφίπολις*). A city of ancient Macedonia, situated in a deep bend of the river Strymon, about 3 miles from the sea (Map: Balkan Peninsula, D 4). Its position on terrace-like hills in a bend of the river made it important as the port of entry for the fertile Strymon valley and Thrace; the neighborhood yielded timber for ships, as well as gold and silver. It belonged originally to the Edonians, a Thracian people, and was called, on account of the roads which met here, *Ἐννέα Ὀδοί* ('Nine Ways'). Aristagoras of Miletus, who first attempted to colonize it, was cut off with his followers by the Edonians. The Athenians next tried to gain possession of it. Their first army, amounting to 10,000 men, was utterly cut to pieces at Drabescus, 465 B.C., but their second, under Hagnon, son of Nicias, was successful, 437 B.C. The Thracians were expelled and a new city was built, to which Hagnon gave the name Amphipolis, because it had the river on both sides. Owing to its mixed population, Amphipolis was not friendly to Athens, and in 424 B.C. readily joined the Spartan Brasidas (q.v.). The Athenian general, Cleon, having been sent to recover the city, was defeated and slain in a battle fought near its walls in 422 B.C.; Brasidas also fell in the engagement. Though nominally restored to Athens by the peace of Nicias (q.v.), Amphipolis seems to have remained independent until its surrender to Philip of Macedon. At Amphipolis was situ-

ated the chief mint of the Macedonian kings; under the Romans it was the capital of eastern Macedonia. In the Middle Ages it was called Popolia. Its site is now occupied by a Turkish town, but a few of its ruins are still visible. Consult Leake, *Travels in Northern Greece* (London, 1835), and Heuzey and Daumet, *Mission archéologique en Macédonie* (Paris, 1876).

AM'PHISBÆ'NA (Gk. ἀμφίς, *amphis*, on both ends + βαίνειν, *bainein*, to go). The type genus of a family of degraded, limbless lizards, of the general appearance of snakes or worms, found only in the West Indies and South America. The best known of the 30-odd forms is the sooty or dusky species, *Amphisbæna fuliginosa*. The body is 18 to 24 inches long and nearly the same thickness throughout; head small, eyes small, ears covered with skin, and tail very short. It tunnels under ground, feeding on insect larvæ and worms. As it moves either way with equal ease, rumor gave it two heads, and asserted that when cut in twain the parts would find each other and reunite. Its dried and pulverized flesh was supposed to possess miraculous curative properties.

AMPHIS'SA (Gk. Ἀμφισσα). The official name of Salona, the capital of the Greek nome of Phocis (Map: Greece, D 3). It is situated 31 miles northeast of Lepanto, at the western foot of the Parnassus, a few miles from the site of Delphi. The town lies in a fertile plain and has trade in tobacco and grain. A road runs to the harbor of Itea, 5 miles to the south, on the Bay of Salona. It is on the site of the ancient Amphissa, which was an important post in the ancient wars against Philip of Macedon. Pop., 1896, 5416.

AM'PHITHE'ATRE (Gk. ἀμφιθέατρον, *amphitheatron*, a double theatre, from ἀμφί, *amphi*, around + θέατρον, *theatron*, a place for seeing; hence, a place, of whatever shape, entirely surrounded by seats for spectators). 1. An architectural structure invented by the Romans for exhibiting gladiatorial combats, fights of wild beasts, and other spectacles. (See GLADIATOR.) These contests were at first given in the Circus (q.v.), later, in the Republican period, in the Roman Forum (q.v.), within hastily contrived wooden scaffoldings; in other Italian towns, too, the gladiatorial combats were long given in the Forum. But in 59 B.C., according to Pliny, *Historia Naturalis*, xxxvi, 117-120, Curio, wishing to surpass all his predecessors in the sumptuousness of his shows, erected two wooden theatres, back to back, where dramatic performances were given simultaneously; and when these were over the two theatres were made to revolve and close up. Their tiers of seats inclosed an arena suited for the contests which then followed. This story, however, is regarded by good authorities as the outcome of a false interpretation of the term *amphitheatrum*, common in modern as in ancient times, by which amphitheatre is interpreted as a double theatre. The elliptical shape of the amphitheatre would have been the natural result of holding the gladiatorial combats in the rectangular Forum; the elliptical shape met the two needs of an amphitheatre—that of confining the combatants to a small space, and that of giving every spectator a good view. Perhaps the model was found in the cities of Campania; for Pompeii had an amphitheatre as early as 70 B.C. Cæsar first erected, in 46 B.C., a permanent structure of this kind in wood. Still, combats of gladiators

and wild beasts continued to be given in the Circus and the Forum. In 30 B.C., under Augustus, Statilius Taurus built the first amphitheatre that was partly of stone, in the Campus Martius: it remained the only one in Rome not entirely of wood until the erection of the Coliseum by Vespasian, whose son and successor, Titus, dedicated the edifice in 80 A.D. Even the upper part of the Coliseum itself was originally of wood until the restoration, after a great fire, in 223. The example of Rome was followed by all the cities of any importance throughout the Empire, where the love of bloody sports, so repugnant to the Greeks, spread rapidly. Amphitheatres were erected throughout Italy and Sicily (Verona, Putcoli, Capua, Pola, Syracuse, Pompeii, Tusculum, etc.), Spain (Tarragona, Italica), France (Arles, Nîmes, Bordeaux, Saintes, etc.), England (Silchester, Cirencester), Germany, North Africa (El-Jemm), Asia Minor (Pergamum, Cyzicus), Greece (Corinth, Sparta). The ruins of almost 100 have been found. Those that are well preserved are among the finest remains of Roman architecture. Whenever possible, the natural incline of a hillside was utilized to save expense, by cutting part of the seats in the natural rock (so, for example, at Pompeii). But in most cases the amphitheatres were entirely free-standing structures of elliptical shape, built of brick, stone, and marble (so at Rome and Verona). The Coliseum (or Colosseum) at Rome seated 87,000 persons, according to a document of the fourth century; but Hülsen believes that there were that number of running feet of benches and that only about 50,000 persons could be seated. Its greatest length is 616 feet, its greatest breadth 510 feet. Several others are of about the same size, as, for example, those at Pozzuoli, Capua, Italica, Verona, Tarragona, El-Jemm. The exterior wall of the Coliseum, nearly 160 feet high, was divided into four stories; the three lower ones consisted of series of arches framed by engaged columns and entablatures, the lowest, Tuscan-Doric; the second, Ionic; the third, Corinthian, according to a common Roman usage. The upper story (added, as already stated, in 223, to replace the original wooden superstructure), was broken merely by windows and pilasters, as well as by the high masts to support the awnings. The lowest arcades served as entrances; four, unnumbered, were main entrances; 76 were numbered entrances leading to the staircases. The arcades of the second and third stories opened on the covered promenade galleries, passageways, and staircases; between each pair of columns stood a statue. On the outside of the topmost story or attic is a row of consoles, in which are sockets for the masts that supported the great awnings (*velaria*), which protected the spectators from the sun when necessary. How these were stretched we do not positively know; it may well be that they covered only the seats, being supported at the inner end by masts on the podium or just behind it. Other amphitheatres vary, from two stories at Nîmes to three at Verona, three and a basement at Pola, and four at El-Jemm. The arrangements were as follows at the Coliseum: There were four tiers, or stories, of seats, forming the *cavea* and corresponding to the four external stories. Under them were five concentric corridors communicating with the staircases; and the raking vaults that support the seats and staircases are one of the most superb and impressive parts of

the structure. The interior of the *cavea*, or place for the spectators, had three sections: the lower one, or *podium*, with the seats and thrones of honor; the *mæniana*, or stepped tiers of seats, occupying the height of two stories; and the *porticus*, or portico. The podium was a platform, about 12 feet high, immediately above and around the arena, reserved for the Emperor and other persons of greatest distinction, including the Senators, and crowned with special boxes and balconies. The *mæniana* were in two horizontal sections, where the spectators could be seated according to their rank; the first 14 rows behind and above the podium were given to the equites, or knights (see EQUESTRIAN ORDER), the rest to inferior citizens. Behind and above the second *mænianum* there was a wall 16 feet high, pierced by windows and doors leading to a corridor. On this wall rested a Corinthian colonnade, which, together with the exterior wall of the whole structure, carried a flat roof. In the portico thus formed were the seats of the women; on the flat roof of the portico was standing-room for the lowest portion of the community. Each row of seats was numbered and the places marked. A large *personnel* kept order. The central space, measuring 280 by 176 feet, in which the contests took place, was called the *arena* (q.v.). Under it was an elaborate system of substructures, not only for under-draining, but also for housing men and animals, with wells, windlasses, and inclined planes for hoisting the animals, and other means of communicating with the arena—such as the *vomitoria*—and with the outside—such as passages to the imperial palaces. Especially interesting is a row of beasts' dens following the oval outline of the arena above. The seats of the Coliseum are not preserved; in the amphitheatres at Verona and Nîmes they have been, and both of these, as well as that at Arles, have been more or less restored and are often employed to-day for public spectacles. Neither is the entire circuit of outer wall as well preserved in the Coliseum as at these cities or at Pola. At Capua and Pozzuoli the substructures of the arena are in perfect condition.

2. A hall for public lectures or demonstrations in an institution of learning, having the seats in successive curved tiers, the room being usually of semicircular plan or approximating this: a famous example is the lecture-hall of the Ecole des Beaux-Arts at Paris, with superb mural decorations by Delacroix. In hospitals and schools of medicine and surgery the principal operating-room or room for surgical and anatomical demonstrations is often called the amphitheatre.

Consult: Friedländer, *Sittengeschichte Roms* (Leipzig, 1881-90); there is a much later edition, the eighth about 1912, translated in four volumes by Magnus, Freese, and Gough under the title, *Roman Life and Manners under the Early Empire* (London, 1910-13); De Ruggiero, *Dizionario epigrafico* (Rome, 1887-93); Middleton, *Remains of Ancient Rome* (London, 1892); Daremberg and Saglio, *Dictionnaire des antiquités grecques et romaines* (Paris, 1881-92); Durm, *Die Baukunst der Römer* (Darmstadt, 1887); Guadet, *Théorie de l'Architecture* (Paris, 1904); Baumeister, *Denkmäler des klassischen Alterthums* (Munich, 1885-88); Lanciani, *The Ruins and Excavations of Ancient Rome* (New York, 1897); Platner, *The Monuments and Topography of Ancient Rome* (New

York, 1911); Babucke, *Geschichte des Kolosseums* (Königsberg, 1899).

AM'PHITRI'TE (Gk. Ἀμφιτρίτη). The daughter of the sea-god Nereus and of Doris, the wife of Poseidon, and mother of Triton. Amphitrite was worshiped only in company with Poseidon and appears with him on many painted votive tablets from Corinth. Her marriage with Poseidon forms the subject of a fine Roman marble relief, in Munich, representing her as drawn in a car by Tritons, surrounded by Nereids and sea monsters. She appears with Poseidon also in representations of assemblies of the gods.

AMPHIT'RUO, or **AMPHIT'RYON**. A comedy or burlesque by Plautus, based on the legend of Jupiter and Alceme, Amphitryon's wife. Its Greek prototype is unknown. It has been well edited by Palmer (London, 1890).

AMPHIT'RYON, or **AMPHIT'RUO** (Gk. Ἀμφιτρύων, Lat. *Amphitryo* or *Amphitruo*). Legendary son of Alcæus of Tiryns. He accidentally killed Electryon, father of Alceme, King of Mycenæ, for which deed he was expelled from Mycenæ. He took refuge in Thebes with his wife Alceme. Here she became the mother of Heracles by Zeus and of Iphicles by Amphitryon. Amphitryon's tomb and the ruins of his house were shown in Thebes in the days of Pausanias. See **AMPHITRUO**.

AMPHITRYON. 1. A comedy of Molière, produced in 1668, and taken from that of Plautus. 2. An opera by Grétry, the words being by Sedaine, produced in Paris, 1781. 3. A comedy by Andrieux, presented in 1782. There are also operas with this title in Italian, Portuguese, and Swedish.

AMPHITRYON, OR THE TWO SO'CIAS. A comedy by Dryden, with musical portions, produced in 1690. It was adapted from Molière's play.

AM'PHIU'MA (corruption from Gk. ἀμφί, *amphi*, on both sides + πνεῦμα, *pneuma*, breath, referring to the gill). A genus of tailed amphibia that loses its tadpole gills, but retains in the adult stage one gill slit on each side of the neck; hence it is half-way between the mud-puppy (*Necturus*), which retains its external gills throughout life, and the newts, which retain neither gills nor slits. See **CONGO-SNAKE**.

AM'PHORA (Gk. ἀμφορεύς, *amphoreus*, Homeric ἀμφιφορεύς, *amphiphoreus*, from ἀμφί, *amphi*,



AMPHORÆ.

on both sides, and φέρειν, *pherein*, to carry). Among the Greeks and Romans, a large vessel,

usually made of clay, with a narrow neck and two handles. Many amphoræ ended in a sharp point below for insertion in a hole in a stand or in the ground. The pointed form of the amphora was used for preserving wine and oil, as in the Panathenaic amphoræ. A peculiar tall and slender form was the Loutrophoros, which was used for water for the bridal bath and to mark the graves of the unmarried. The amphora appears in a great variety of forms among the Greek painted vases. Amphora was also a liquid measure in Rome, equivalent to 26.26 litres, or about seven gallons. Among the Romans wine, oil, fruits, nuts, and other small objects were transported regularly in amphoræ, even across seas, so that the carrying capacity of a vessel was reckoned at so many hundred or thousand amphoræ. The name was also given sometimes to the Attic metretes—equal to about 11 gallons. In modern times *anfora* is the name of a wine measure in Venice. See VASE.

AM'PLIFICA'TION (Lat. *amplius*, large + *facere*, to make). A term in rhetoric, meaning that an idea, an opinion, or an inference is presented to the mind accompanied by accessory circumstances. Its aim is to make a powerful and vivid impression on the reader or the hearer. It is generally produced by breaking up general statements into particulars, by employing some form of repetition, by adding illustrative details, and by quotation. This is called also the dynamic method of rhetoric, and is especially effective in addressing juries or popular assemblies. The most remarkable instance of amplification in English oratory is to be found in Daniel Webster's thrilling address to the jury in the famous case of the shocking Knapp-Crowninshield murder (1830). Consult Genung, *The Working Principles of Rhetoric* (Boston, 1901).

AM'PLITUDE (Lat. *amplitudo*, from *amplus*, large). In astronomy, the angular distance of a heavenly body at the time of its rising or setting from the eastern or the western point of the horizon. When the sun is in the equator (i.e., at the time of either equinox), it rises exactly east and sets exactly west, except for the small effects of refraction (q.v.). Therefore, at these times the amplitude is zero. Its amplitude is at the maximum at midsummer and again at midwinter; and that maximum depends upon the latitude of the place, being $23\frac{1}{2}^\circ$ at the equator and increasing to lat. $66\frac{1}{2}^\circ$, where it becomes 90° . The amplitude of a fixed star remains constant all the year round.

AMPTHILL, ämt'hill, FIRST BARON. See RUSSELL, ODO WILLIAM LEOPOLD.

AMPUL'LA (dimin. of *amphora*, or rather of the older form *ampora*; in Greek, *λήκυθος*, *lēkythos*). Apparently a generic term among the ancient Romans for any little bottle of earthenware, glass, or other material, used for holding liquids, especially oil for use after the bath, or ointments; a common form was that of a tall, slender, narrow-necked vessel with a handle. The *ampulla Remensis* (the holy vessel, Fr. *la sainte ampoule*) was the name of that famous vessel in which was contained the unguent (believed to have been brought by a dove from heaven) that anointed Clovis (q.v.), King of the Franks, at Rheims in 496 A.D., and with which every succeeding monarch of France, down to Louis XVI, was anointed at his coronation. This ampulla was shattered, along with a great many more valuable things, at the Revolution of 1789; but a fragment of it was preserved by some de-

vout royalist, and handed over at the restoration to the Archbishop of Rheims. Curious to say, a little of the miraculous substance still remained, and, being mixed with oil, was used to anoint Charles X in 1825.

AM'PUTA'TION (Lat. *amputare*, to lop off, cut around). The cutting off of a part which, by its condition, endangers the safety, health, or comfort of the patient. Injury, gangrene, and malignant growths are the most frequent causes for amputation. The amputation of a limb was in ancient times attended with great danger of the patient dying during its performance, as surgeons had no efficient means of restraining the bleeding. They rarely ventured to remove a large portion of a limb, and when they did so, cut in the gangrened parts, where the vessels would not bleed; the smaller limbs they chopped off with a mallet and chisel; and in both cases had hot irons at hand with which to sear the raw surfaces, boiling oil in which to dip the stump, and various resins, mosses, and fungi, supposed to possess the power of arresting hemorrhage. Some tightly bandaged the limbs they wished to remove, so that they mortified and dropped off; and others amputated with red-hot knives, or knives made of wood or horn dipped in vitriol. The power of controlling hemorrhage was obtained by the invention of the ligature by Paré in the sixteenth century, and by the invention of the tourniquet (q.v.) in 1674 by a French surgeon, Morell. The ancient surgeons endeavored to save a covering of skin for the stump, having the skin drawn upward by an assistant before making the incision. In 1679 Lowdham, of Exeter, suggested cutting semicircular flaps on one or both sides of a limb, so as to preserve a fleshy cushion to cover the end of the bone. Both these methods are now in use, and are known as the "circular" and the "flap" operations; the latter is most frequently used.

A "flap" amputation is performed thus: The patient being placed in the most convenient position, an assistant compresses the main artery of the limb with an elastic band or a tourniquet. Another assistant supports the limb. The surgeon with one hand lifts the tissue from the bone, and transfixing with a long narrow knife, cuts rapidly downward and toward the surface of the skin, forming a flap; he then repeats this on the other side of the limb. An assistant now draws back these flaps, and the knife is carried round the bone, dividing any flesh still adhering to it. The surgeon now saws the bone. He then seizes the larger blood vessels with artery forceps and ties them with ligatures. All the vessels being secured, after removal of the tourniquet, the flaps are stitched together and a suitable dressing applied. With the advent of antiseptic methods and anæsthetics, and a better understanding of the processes of tissue repair, the necessity for amputation has greatly diminished, particularly in military surgery. Modern high velocity missiles are aseptic, and often bore a clean hole through a bone without shattering it; and the immediate application of an emergency dressing or "first aid packet" insures prompt healing.

AM'PYX (Gk. *ἄμρυξ*, a woman's head-band, a snood). A characteristic Ordovician genus, comprising about 50 species, restricted to North America and Europe, of blind trilobites, in which the central portion (*glabella*) of the head shield is often armed with a cylindrical or angu-

lar sharp spine, the length of which in many species exceeds that of the entire body. Long curved spines are also developed upon the genal angles or posterior corners of the sides of the head shield. The thoracic portion of the body is short, consisting of five or six segments, and the tail shield is triangular and unarmed. For illustration, see TRILOBITA.

AMRAPHEL, äm'ra-fél. A King of Shinar, i.e., Babylonia, who, according to Genesis xiv, invaded Palestine, together with Chedorlaomer, King of Elam, Arioch, King of Ellasar, and Tidal, King of Goiim. There is no account of this expedition in Babylonian literature, and none of the names has been identified with certainty. But it does not seem improbable that the account of such an expedition has been drawn from Babylonian sources. The names of the four kings inspire confidence. Ed. Meyer in 1884 called attention to the genuinely Elamitish character of the name Chedorlaomer (Kudur Lagamar); and Schrader three years later identified Amraphel with Hammurabi. Dhorme has suggested that the Hebrew form of the name is due to the last sign *bi* having been written *bi*, as sometimes happens, and this sign has also the value of *pi*. Another manner of writing it was Hammurapi. If the expedition is historical, it must have taken place before the thirtieth year of the King's reign. The discovery by King that the second Babylonian dynasty was at least in part contemporaneous with the first has reduced his date, which may now be placed with some degree of confidence in 2124–2081 B.C. It still remains doubtful whether any light is thrown by this identification on the historic character or date of Abraham. See HAMMURAPI; ARIOCH; CHEDORLAOMER; and consult Dhorme in *Revue Biblique*, p. 205 (1908).

AMR IBN AL-AS, äm'r 'b'n äs (died 663 A.D.). An Arabian general. He was one of Mohammed's disciples, though before his conversion in 629 A.D., a furious opponent. Chiefly to him were the Prophet's successors indebted for the conquest of Syria. In 640 he led 40,000 men into Egypt and within three years effected the subjugation of the country. In 642, after a siege of 14 months, he took Alexandria, losing 23,000 men. In the struggle between Ali and Muawiya for the caliphate, Amr sided with the latter and to him was due the triumph of the Umayyads over the Alids. From 661 to his death he was Emir of Egypt and by his wise administration facilitated the conversion of the country to Islam. He is credited with projecting a canal to unite the Mediterranean and Red seas and is charged with causing the destruction of the famous library at Alexandria; but the charge may well be dismissed, as it was not advanced until six centuries after his death. Consult Sir William Muir, *The Caliphate* (London, 1891).

AMR IBN KULTHUM. A famous Arabic poet whose chief work was given a place in the Muallakat (q.v.). He lived in the sixth century A.D. and was head of the Taghlib tribe. His mother was Laila, the daughter of a poet, al Muhallil. Because of an insult to her he slew Amr ibn Hind, one of the Lahmid rulers at Hira in 570. Consult Rothstein, *Die Dynastie der Lahmididen in al Hira*, p. 100 (Berlin, 1899).

AMRITSAR, üm-rit'sär (*Umritsar*). A city of the Punjab, India, in lat. 31° 40' N. and long. 74° 45' E., on the Sindh, Punjab, and Delhi Railway (Map: India, B 2), 330 miles by rail

northwest of Delhi. It is the capital of a district of about 1600 square miles area, with a population of over 1,000,000, and of a division with an area of 5354 square miles and a population of about 2,750,000, both of the same name. Amritsar is, next to Delhi, the richest and most prosperous city in northern India, being connected with Lahore, the capital of the Punjab, distant 36 miles to the west, by a canal, and possessing considerable manufactures of cotton, silks, shawls, carpets, etc., and carrying on a large trade. It is the religious centre of the Sikhs—a distinction which, along with its name, it owes to its "pool of immortality," on an islet of which stands the marble Darbar Sahib, the chief temple of the Sikh faith, maintaining an establishment of over 500 priests and founded in 1574 by the minor apostle Guru Ram Das. Amritsar is a favorite pilgrim resort; and it was the place where, perhaps to bind the Sikhs more firmly, was signed the treaty of 1846, providing for the cession to the British of the territory between the Beas and the Sutlej. The huge Govindgarh, or fortress, built in 1809, is the most prominent feature of Amritsar. The town has a good water supply in connection with the Bari Doab Canal. It is a municipality of the first class and is the seat of a native college. Pop., 1901, 162,429; 1911, 152,756.

AMRU-'L-KAIS, äm'rōo-'l-kīs' (written also **IMRU'LKAIS** and **AMRULCAIS**). By many esteemed the greatest of Arabian poets. He was the son of Hujr and belonged to the South Arabian family of the Kinda. His life falls in the sixth century. One of his ancestors established a principality in Nejd; but their power dwindled more and more, and Amru-'l-Kais struggled in vain to recover it. About 530 he was invited by Justinian to Constantinople, where he spent many years. Before leaving he left his daughter and treasure with the Jewish ruler Samu'al ben Adia, who preferred to have his son die rather than to hand over what had been intrusted to him to Harith, the Ghassanid. He was made Phylarch of Syria by Justin II and is said to have died in Ancyra from poison sent him because he had seduced a princess in Constantinople. He was the author of the first poem in the collection called the Muallakat (q.v.). See Sir William Jones, *The Moallakat* (London, 1782); W. Ahlwardt, *The Diwan of the Six Ancient Arabic Poets* (London, 1870); G. de Slane, *Le divan d'Amro'l Kais* (Paris, 1837); F. Rückert, *Amrilkais, der Dichter und König* (Stuttgart, 1843).

AMRUM, äm'rōom, or **AMROM**, äm'röm. One of the north Frisian Islands, on the west coast of Schleswig, Germany, south of the Sylt, an island of the same group (Map: Denmark, B 4). The island is about 6 miles long and has an area of about 8 square miles. On the west side are high sand-dunes. It is unproductive. The fishing and oyster gathering were formerly considerable, but have dwindled away. Except for a little grazing land, the island is important only as a watering place. Pop., 1900, 900.

AMSDORF, äms'dôrf, NIKOLAUS VON (1483–1565). A German Protestant reformer, an early and determined supporter of Luther. He was born at Torgau, Dec. 3, 1483, educated at Leipzig, and was among the very first students of the university at Wittenberg (1502), where he afterward taught philosophy and theology. He was with Luther at the Leipzig disputation (1519) and the Diet of Worms (1521) and was

in the secret of his Wartburg seclusion. He assisted the first efforts at reformation in Magdeburg, Goslar, and Einbeck. He was active in the Smalkald debates and spoke strongly against the bigamy of the Landgrave of Hesse. He was made Bishop of Naumburg in 1542, but was driven away in 1547 by the Imperial party during the Smalkaldic War, and took part in founding the University of Jena. In 1552 he became superintendent at Eisenach, where he died unmarried, May 14, 1565. He superintended the publication of Luther's works and opposed Melancthon on the separation of the High-Lutheran party. He is the author of the familiar dictum, "good works are prejudicial to salvation," by which he meant those works which man thinks in themselves certain to save his soul. For his biography, consult: T. Pressel, *Leben und ausgewählte Schriften der Väter und Begründer der lutherischen Kirche* (Elberfeld, 1862); also Meurer, vol. iii (Leipzig, 1863).

AMS'LER, SAMUEL (1791-1849). A prominent line engraver of the German school, born at Schinznach, Switzerland. After preliminary training with Lips at Zürich, he studied at the Munich Academy under Hess. Proceeding to Rome in 1816, he came under the influence of Thorwaldsen and Cornelius. His technique, modeled upon that of Dürer and Marcantonio, is powerful and sure, and he is very faithful to the originals followed. His chief works include engravings of "Alexander's Triumphal Procession" by Thorwaldsen, Dannecker's "Christ," and Overbeck's "Triumph of Religion and the Arts." He is especially known as an engraver of the works of Raphael.

AM'STERDAM (earlier *Amstelledamme*, the dam or dyke of the Amstel). The chief city of the Netherlands, situated at the confluence of the Amstel with the Y or Ij (pronounced eye), an arm of the Zuider Zee (Map: Netherlands, C 2). Amsterdam has an area of 18½ square miles and has the shape of a semicircle, its diameter being the Y or Ij. The town is further cut up into six other concentric zones by canals. Other canals (or *grachten*) split up the city into 90 islands, crossed by about 300 bridges. Along these, rows of trees are planted, making the finest avenues of the city, of which the Singelgracht, 7 miles long, the Prinsengracht, the Keizersgracht, and the Heerengracht, which is 147 feet wide, are the most handsome. The bridge over the Amstel, the Hoogesluis, has 32 arches, is 620 feet long, and affords a fine view of the city and harbor. In the southern part of the city some of the canals have been drained and filled in to form broad streets, as also a portion of the Y, which now is the site of the central railroad station. The great square of Amsterdam is the so-called Dam, getting its name from its position on the west side of the old wall that is popularly believed to be the site of the city's first foundations. Around it are the royal palace, the exchange, and the Nieuwe Kerk (New Church), and from it as a centre radiate the principal streets and street-car lines of the city. Here is the monument to the loyalty of Holland during the Belgian revolution of 1830-31. It is called *Het Metalen Kruis* ('the metal cross'), a reminiscence of the commemorative war medals then issued. Here, too, for one week in summer the boys of the city have the privilege of playing, because, it is said, in 1622 some boys here discovered a conspiracy of the Spaniards against the town.

Many of the buildings of the city are in the Dutch brick style of the seventeenth century. They are all built on piles, because of the loose, shifting nature of the sandy soil. It is necessary to go down from 14 to 60 feet before a firm foundation can be secured. An interesting part of the city is the Jewish quarter, the Jews having formed an important element of the inhabitants from the middle of the seventeenth century. In this part of the city Rembrandt lived and Spinoza was born.

Among the ecclesiastical structures of the city, the Nieuwe Kerk (New Church), or St. Catharine's Church, a cruciform basilica in the late Gothic style, erected in 1408-78, is the finest. The interior contains interesting remnants of old stained glass, a beautifully carved pulpit, executed by Vinckenbrinck in 1649, and monuments to Admiral de Ruyter and the famous Dutch poet Vondel. Here the Dutch sovereigns are enthroned. The Oude Kerk (Old Church), or St. Nicholas's Church, a Gothic structure dating from about 1300, is noticeable for handsome stained-glass windows of the sixteenth and seventeenth centuries, and contains several monuments to naval heroes. In the Jewish quarter the synagogue of the Portuguese Jews is interesting, as being built in imitation of Solomon's Temple; it also boasts a considerable number of costly vessels. The handsomest secular edifice is the royal palace, built by Jacob van Kempen in 1648-55 as a *stadthuis*, or town hall, a massive structure resting on a foundation of 13,659 piles, and surmounted by a round tower rising 187 feet from the base and commanding an extensive view. The gilded vane of the tower represents a merchant vessel. The building is adorned with numerous statues, bas-reliefs, and mural paintings, the interior profusely decorated by eminent Dutch sculptors (especially Artus Quellinus) and painters of the seventeenth century. All the principal apartments are lined with white Italian marble and richly adorned with sculptures, especially the magnificent reception room, an apartment of great splendor, and one of the largest halls in Europe, measuring 120 feet in length, 57 feet in width, and 100 feet in height. The building was converted into a royal residence in 1808, being presented by the city to King Louis Bonaparte. The Rijks-Museum, a stately edifice, erected in 1877-85, in the early Dutch Renaissance style, with various Gothic and Romanesque characteristics, is richly adorned with the work of Dutch architects, painters, and sculptors, including allegorical bas-reliefs, encaustic paintings, and figures in colored tiles, symbolic of the Dutch towns and provinces. The museum contains one of the most important collections of paintings and engravings in the world. The works of Rembrandt are especially well represented, and besides his most celebrated work, the so-called "Night Watch," include "De Staalmeesters" ('Syndics of the Cloth Hall'), "The Jewish Bride," and one of his most finished portraits, that of "Elizabeth Bas." Van der Helst's "Banquet of the Civic Guard," is another highly prized gem of this collection, which abounds in select paintings by the most famous Dutch and Flemish masters. The museum further includes an interesting department showing the development of ecclesiastical art in the Netherlands from the Carolingian period to the seventeenth century, and a valuable collection of objects of industrial art. In the

Fodor Museum may be seen 161 admirable paintings by modern Belgian, Dutch, and French artists; about 300 drawings by old masters, and about 100 engravings. The Six Gallery is a small but extremely valuable collection of paintings by the old Dutch masters, while the modern Dutch artists may be studied to great advantage in the Municipal Museum, containing about 200 select specimens.

Amsterdam has long been renowned as a centre of learning. The school known as the *Athenæum Illustre* of Amsterdam, which was founded in 1632, in 1877 was reorganized as the University of Amsterdam. Its library now has 148,000 volumes, including the Rosenthal collection of 8000 works on Jewish literature. It is rich in manuscripts and original letters. Amsterdam possesses excellent facilities for medical study; her hospitals are famous. Other educational institutions are state, normal, industrial, and commercial schools, the National Academy of Arts, the Royal Academy of Sciences, the Royal Dutch Geographical Society, a school of navigation, and a municipal school for primary teachers, and a school of acting. The Botanical Gardens rank among the foremost in Europe, and are equipped with a library and ethnographical museum. They were established by the society *Natura Artis Magistra*, founder also of the Zoölogical Gardens. There are numerous other institutions of learning and scientific societies, the most remarkable of the latter being the *Maatschappij tot nut van't Algemeen*, or Society for the Public Welfare, which has spread over all Holland. It was founded at Edam in 1784 and moved to Amsterdam in 1787. It aims at bettering the education and culture of the people and strives toward this end in every possible way.

Amsterdam has six theatres, one of them owned by the city. Prominent among the benevolent institutions are the various orphan asylums, one of which, the Diaconic Asylum, erected in 1889, has about 1200 inmates.

For centuries Amsterdam has been the centre of Dutch industry, and its diamond-polishing factories are the most extensive in the world. These are exclusively in the hands of the Portuguese Jews and employ upward of 12,000 workmen. Machinery manufacture, ship building, and iron molding are important industries, and there are large refineries for borax and camphor, producing over 22,000 tons annually. The preparation of rice for the market amounts to 23,000 tons yearly, and besides, there are large glass-blowing establishments and many breweries and lumber mills. Other manufactures are articles of gold and silver, silk, porcelain, and carpets, cordials, chocolate, tobacco, leather, dye-stuffs, astronomical instruments, chemicals, cobalt blue, stearine and sperm candles, and sailcloth.

Amsterdam's commercial importance has advanced rapidly since 1865. Since 1876 the short North Sea Canal has been in operation, running to an artificial harbor of 250 acres on the North Sea. The celebrated North Holland Canal (1825) has been supplanted by it for most of the sea traffic. The Merwede Canal to Gorinchem was built in 1892. Within the city much attention is paid to dredging and improvement of the canals centring to the north in the three islands, near which are the docks of the various steamship lines that connect the city with all the great ports of the world. Here, too, are

the naval docks and stores, a vast system of docks for merchant shipping, granaries, and railway terminals for the reception of coal and iron ore, raw materials, etc. Another canal connects Amsterdam with Utrecht. There is a floating dry dock on the north bank of the Y for ships of 4000 tons and of 16 feet draught, while another dock of twice the size has been constructed. Amsterdam had need of such improvements, for her percentage of shipping entering Holland was 18.8 in 1889 and 6.66 in 1899; by 1911 it had risen to 13.5. In 1911 the total tonnage, entered and cleared, was 3,411,000.

The chief trade is with the Dutch East Indies, and the imports are mainly tropical products, such as raw sugar, Java and Sumatra tobacco, coffee from Brazil and Java, tea, chemicals, cinchona, and other drugs, lumber, and rice. Other articles of import are machinery and manufactured articles, wheat, glassware, and petroleum. In addition to the colonial products—coffee, tobacco, drugs, and rice—Amsterdam exports such Dutch products as cheese, beer, and manufactured articles mentioned above.

Amsterdam is the chief financial centre of the Netherlands. Its stock exchange, once the centre of the world's banking transactions, is still of considerable importance. There are many other financial and commercial institutions, and the city is the seat of the Bank of the Netherlands established in 1814 on the model of the Bank of England. It has full control of the country's paper money. It is the successor of the famous Bank of Amsterdam, founded in 1609 and dissolved in 1796, which played so important a rôle in the history of banking.

Amsterdam has a complete network of communications with the interior through railway and steamship lines, while various electric lines traverse her streets. There is also a suburban steam railroad.

Amsterdam's new method of fortification merits some attention. In 1870 the old walls had all been razed, and since then a system of dikes and sluices has been devised whereby the surrounding country may be flooded; so that now there is only one fort, that at the entrance to the harbor.

Upward of one-fifth of the population of Amsterdam are Catholics, and the Jews form nearly one-ninth. There are, besides, many Germans. Pop., 1879, 316,000; 1900, 510,900; the census of Dec. 31, 1909, showed 566,131 inhabitants, and the estimate of Dec. 31, 1911, 580,960.

History. We first hear of Amsterdam in the thirteenth century. Giesebrecht II of Amstel built a castle there in 1204 to protect the town, and in 1240 his son, Giesebrecht III, for the purpose of keeping out the sea, constructed a dam, which gives the town its name. The count of Holland, Floris V, gave the city free trade with his territories, and Amsterdam became part of the County of Holland in 1347. From now on the town increased rapidly, and, though devastated by fire in 1421, it was influential enough to obtain from Maximilian I the right of bearing the imperial crown as its crest. After the war of independence, when Antwerp succumbed to the Spaniards, Amsterdam became the chief commercial centre of the North; and after the foundation of the Dutch East and West India companies, in the first quarter of the seventeenth century, with their headquarters in the city, it attained still greater

prosperity. Even the wars with England in 1652-64 and 1665-67 did not long hinder its progress. The decline of the city came in the latter part of the eighteenth century, as a result chiefly of the war with England of 1780-84 and the alliance with France. Its commerce disappeared entirely after it became a part of the French Empire in 1810, only to be revived in the second half of the nineteenth century by the building of the great canals to the sea and to the Rhine system.

AMSTERDAM. A barren islet of volcanic origin, in the Indian Ocean, situated in lat. 37° 52' S. and long. 77° 37' E. It covers an area of about 25 square miles and, together with the adjacent island of St. Paul, forms a dependency of Mauritius. Both islands lie about midway between the Cape of Good Hope and Tasmania. It was discovered by Van Diemen in 1663, and came under French control late in the nineteenth century.

AMSTERDAM. A city in Montgomery Co., N. Y., 33 miles by rail northwest of Albany; on the Mohawk River, the Erie Canal, and the New York Central and Hudson River and the West Shore railroads (Map: New York, F 3). Prominent features include St. Mary's Catholic Institute, the Fort Johnson Museum, homes for aged women and children, and two hospitals. Amsterdam has factories producing knit goods, carpets, rugs, wagon springs, linseed oil, brooms, silk gloves, paper boxes, etc. First settled about 1778 and known as Veedersburg until 1804, Amsterdam was incorporated as a village in 1830, and as a city in 1885. Pop., 1890, 17,336; 1900, 20,929; 1910, 31,267.

AMSTERDAM, UNIVERSITY OF. A Dutch university founded by the city of Amsterdam in 1632 as the Athenæum Illustre, in 1867, after a checkered existence, it was reorganized, and in 1877 was raised to the dignity of a royal university, ranking with those of Leyden, Groningen, and Utrecht. In 1911-12 it had 1130 students and an income of over 600,000 florins. Its faculties include law, medicine, mathematics and science, arts, and theology. Its administration is in the hands of a "Curatorium" of five members and a secretary, chosen by the crown. The professors form the Senate, with a Rector Magnificus as their head, and a Secretary of the Senate. The library is large and includes a number of special collections, particularly in Hebrew and on medicine.

AMU, à-mōō', or **AMU DARYA**, à-mōō' dār'yä (ancient OXUS). A large river of Central Asia, which has its source in the Pamir plateau between India and Bokhara, flowing thence northwest in the Aral Sea. In its course through the mountains it is joined by the Surkhab from the region of the Alai and Trans-Alai Mountains, by the Kafirnahan and Surkhan from the Hazrat Sultan chain, and by numerous smaller streams, but after emerging from the outer slopes it receives no important tributaries. The Zerafshan on the north and the Murghab on the south, which formerly drained into the Amu, now lose their waters in the desert regions at some distance from its bed. It is navigable by light-draught boats for nearly one-half of a total length of about 1600 miles, but its chief importance is as a reservoir for irrigation rather than as a commercial highway. Some geographers assert that the course of the Amu has been changed within historic times, holding that, as late as the first half of the six-

teenth century, it flowed into the Caspian Sea, and that the course has been changed twice to the Aral Sea. Consult: Sir H. C. Rawlinson, "The Road to Merv," in the *Proceedings of the Royal Geographical Society*, new series, vol. i, p. 161 (London, 1879); Krapotkin, "The Old Beds of the Amu-Daria," *Geographical Journal*, vol. xii (London, 1898).

AMUCK', or **AMOK'**, RUNNING (Javanese *amook*, to kill). A practice in Java among those in whom a ferocious madness is produced by long use of opium. The sufferer rushes abroad, armed with some weapon, usually a *kris* or large dirk, striking indiscriminately at all whom he encounters. When one is seen to start on his madness, the people cry "amok" and immediately hunt the maniac to death. Probably in many cases this is deliberate on the victim's part, as a means of suicide.

AMULET (Lat. *amuletum*, from Ar. *hamalet*, that which is suspended). Any object worn as a charm, or sometimes placed in a building to ward off evil. Amulets originated at an early date in the Orient, and regard for them is among the earliest superstitions of the Babylonians and Egyptians. The magical formulas connected with them are frequent in early Babylonian texts. Their religion included belief in a multitude of spirits present everywhere and influencing every act. Hence the necessity of preserving the house, property, and person by images and formulas, and these were from the beginning connected with medicine. Not only among the ancient Egyptians but also among many savage peoples of to-day, a large proportion of the forms of ornamental art were originally amulets, i.e., possessed of magical efficiency. (See ANIMISM, FETISH.) Even the monotheistic Hebrews were not free from the taint, and the so-called *phylacteries*, with passages from sacred writ, were an adaptation of these magical beliefs. The Greeks and Romans inherited the same beliefs in a modified degree. Perhaps the most general evil to be guarded against by amulets at all times was the Evil Eye, which is still so firmly believed in throughout Latin countries. There were various classes of amulets. First came certain precious or other stones supposed to possess mysterious helpful properties: agates for spiders' and scorpions' stings, and for protection against thunderstorms; diamonds for melancholy; jasper for the tongue-tied and to bring on rain; amethyst against drunkenness, and, with certain inscriptions and figures, as antidotes to poisons, hail, and locusts, etc. One of the most permanent of all such beliefs is that in the beneficial effects of coral. Metals, also, and plants, were used as amulets. So were various parts of certain animals, such as hyena teeth or marrow, wolves' fat, rats' ears, foxes' tongues, and bats' heads. Most efficacious of all are the teeth of different animals. After these natural objects come artificial ones. A large proportion of ancient jewelers' work was undoubtedly made in connection with the wearing of amulets, especially necklaces, rings, bracelets, earrings, and other pendants. Other ways of carrying amulet material was in gold balls or *bullæ*, or in sachets. The formulas carried were usually inscribed, not on paper, but on some durable substance—metal, terra cotta, ivory, precious stones. Trinkets of every variety and shape—crescents, disks, pendants—were hung about the necks of children and adults as charms; and

few went without them. Figures of gods and genii had magic virtue as well; so did verbal formulas. (See ABRACADABRA, and ABRAXAS.) Many of such tiny images are found on necklaces. Anchors and horseshoes, heads and figures of animals, votive hands and feet, thunderbolts, vases, and many other objects, all had their specific values. The amulets not only were suspended around the neck, worn in jewelry, and sewed in the clothing, but also were affixed to furniture and walls, painted or carved on doors and walls, and buried in the ground. They even followed the deceased to his grave. Christianity was as unable as Judaism to eradicate the practice; so it sought to mitigate it by legislation and by offering devotional substitutes in the form of sacred relics or formulas from the Bible. These substitutes were carefully distinguished from the heathen amulets which the clergy were forbidden in the fourth century to make, under pain of deprivation of holy orders, and the wearing of which was solemnly condemned by a council in 721. But in the East the practice still flourishes, as well as in parts of southern Europe. Consult King, *History of Precious Stones and Gems* (London, 1873), and Kunz, G. F., *The Curious Lore of Precious Stones* (Philadelphia, 1913).

AMUNDSEN, ä'mün-sen, ROALD (1872—). A Norwegian explorer, born at Borge, Norway. He was educated for the naval service of Sweden-Norway, and became a second lieutenant. In 1901 he made observations on the East Greenland current which were considered valuable. He was permitted to join the *Belgica* expedition to the Antarctic in 1897-99, and was first officer of the ship throughout that expedition, which explored the region west of Graham Land. He sailed from Norway, June 17, 1903, in the ship *Gjøa*, for the purpose of relocating the position of the north magnetic pole to the north of the American mainland and making a magnetic survey of that region. Sir James C. Ross, in 1831, had fixed the position of the magnetic pole on the west coast of Boothia. Amundsen made his headquarters on the southeast side of King William Land, and, by many excursions, he was able to prove that the north magnetic pole has no immovable and stationary position but in all probability is in continual movement. His numerous observations during 19 months were taken to Norway, where their study is not yet completed. Captain Creak, the British authority on terrestrial magnetism, wrote in 1906 that years would elapse before the observations would be in form to yield the definite information expected.

During this work Lieutenant Hansen charted the east coast of Victoria Land, which had never been surveyed, as far north as the seventy-second parallel. The land formerly seen by Dr. Rae at the south end of Victoria Strait proved to be a group of over 100 small islands. The feature of Amundsen's work, however, which excited most general attention was his achievement of the Northwest Passage. In the summer of 1905 his party made their way from King William Land westward through the channels between the American mainland and the islands, reaching near Herschel Island on August 13, waters that are visited every year by San Francisco whalers.

After his return to Europe Amundsen began preparations for his proposed five years' drift on Nansen's ship, the *Fram*, across the north

polar area to make a scientific study of all the natural phenomena that could be observed. His plan was endorsed by leading geographers, but the necessary funds had not been provided up to 1910. The explorer, however, sailed from Norway on August 9, that year, though lacking \$40,000 worth of equipment that he deemed necessary for the northern undertaking. He believed he had ample supplies for an attempt on the south pole, but he did not announce his purpose until he reached Madeira, when he wrote to Nansen that he thought his chances for reaching the south pole were good, and success in that field would doubtless bring him the funds needed for the northern project. His comrades agreed to stand by him in the new venture, and the *Fram* sailed for the Antarctic.

The Bay of Whales, 115 miles west of King Edward VII Land, became Amundsen's base of operations. He had conceived the daring idea of planting his winter camp on the surface of the great ice barrier. He arrived in the Bay of Whales on Jan. 14, 1911. Fourteen days later all the material for his house, all the supplies for nine men for two years, had been taken to the top of the ice, the house erected, and Amundsen and his landing party and 97 Eskimo dogs were established in their winter camp.

Amundsen remained in the Antarctic a few days over a year. While the climax of his work was the discovery of the south pole, the whole period was marked by first-rate achievement and the best of good fortune, much of which could not have been his if he had not prepared for every undertaking with exhaustive attention to detail. His equipment met every requirement. He had placed his whole trust in Eskimo dogs and skis with the result that he was able to plant his supply stations far to the south, each depot so well marked by flags and signs that he could find it later even in dense fog. His dogs were so well and carefully kept that they were able to render the best service. Before the sun disappeared his party had secured 66 tons of fresh seal meat for men and dogs.

On Dec. 14, 1911, Amundsen and his four comrades reached the south pole after a journey of 863 miles from their camp. When they reached the end of the ice barrier and began to ascend the slope of the Antarctic continent, they were still 335 statute miles from the pole. Mounting to the plateau, the highest altitude attained was 11,124 feet above sea level; and from this place they traveled to the pole over an even plain at practically the same level. Many mountain ranges and isolated peaks rose to heights of 16,000 feet and more. The large area of new land discovered and scientific contributions to several departments of knowledge placed this expedition among the most successful of polar enterprises. After his return from the south pole Amundsen lectured in most countries of Europe and North America and in Australia. His book, entitled in the English edition "The South Pole" (1913), was published in several languages.

When Amundsen returned home, the Norwegian government appropriated a sum of money practically adequate for the needs of his proposed drift across the Arctic Ocean; one of the geographical societies also contributed \$25,000 towards the work. The explorer expected in 1914 to push the *Fram* into the ice of the Arctic Ocean north of Bering Strait.

AMUR, ä-moor'. A province of eastern Si-

beria (q.v.), situated north of the Amur River; area, 174,427 square miles. It was ceded by China to Russia in 1858. The capital is Blagovyeschensk. Pop., 1891, 87,705; 1897, 120,306; 1912, 230,200.

AMUR. A river of eastern Asia, formed by the junction of the Shilka and Argun rivers, near the Russian village of Ust-Strielka, at the north end of the Khingan Mountains, lat 53° 20' N. and long. 121° 28' E. (Map: Asia, N 4). From the point of junction of the two rivers the Amur flows at first east and then southeast along the northern boundary of Manchuria, to about parallel 48° N. and long. 131° E. at Ekaterino-Nikolsk, where it turns east-north-east, and at about 137° northeast, and near Fort Nicolayevsk, in lat. 53° 20' N., it empties into the strait which separates the island of Saghalin from the mainland, near the point where that channel opens into the Sea of Okhotsk. Including its headstream of Argun, the Amur has a total length of nearly 2800 miles, and its basin is estimated at more than 770,000 square miles. The principal tributary of the Amur is the Sungari, which joins it on the right near the point at which the Amur begins its great bend toward the north and soon after passes through a gorge 140 miles long. Another important affluent from the right is the Ussuri. The chief affluents on the left are the Zeya and the Bureya. The river is very wide in the lower part of its course, and there are many islands in it. The great station of the steamers that navigate the Amur and the Ussuri is Khabarovsk (formerly called Khabarovka), which is connected by rail with Vladivostok. On the left bank of the Amur, near the parallel of 50°, is Blagovieshtchensk, the capital of the Amur territory. A short distance below this town, on the opposite bank, is Aigun. The Amur is navigable for smaller vessels through its entire course, and steamers can ascend the Shilka beyond the town of Strietensk. As far as the mouth of the Zeya, vessels drawing as much as eight feet can go. The Amur is open for navigation for only about six months in the year. The region through which it flows is partly covered with thick forests, and but few settlements are found on its banks. Gold is mined in some quantity on its upper waters.

As early as 1636, several Russian adventurers, attracted by rumors of the wealth of the regions to the southeast of Lake Baikal, made excursions into the Chinese territories on the Lower Amur by way of the Shilka River. In 1649 Khabarov descended the Amur, subdued the native tribes, and erected a number of forts at the junction of its tributaries. In 1658 Nertchinsk on the Shilka was founded, and about 1665 Fort Albasin was erected. The Chinese, who had watched the Russian advance with great uneasiness, now took up arms, attacked Fort Albasin repeatedly, and in the peace of Nertchinsk (1689) succeeded in closing the Amur to the Russians, who for more than 150 years made no conquests in Manchuria, and contented themselves with extending their influence through commerce, missionary work, and diplomacy. With the appointment of Count Nicholas Muravieff to the governorship of East Siberia, active operations recommenced. A line of forts was constructed on the Amur, the coast of the Gulf of Tartary, and the island of Saghalin. In four expeditions undertaken in 1854 and subsequent years Muravieff established the

authority of Russia over the Amur region, and some slight attempts were made at colonizing the country with Russian settlers. With the English and French marching upon Peking, China could not resist the Russian encroachments. The treaties of Aigun and Tien-tsin concluded in 1858, and the supplementary treaty of Peking in 1860, in ceding eastern Manchuria to the Russians, merely gave formal recognition to an accomplished fact. By these treaties Russia obtained possession of all the country between the Pacific and the Amur, the Ussuri and the Tiumen rivers down to the Korean frontier. In this manner the long-desired goal of Russian foreign policy, an outlet and an ice-free port on the Pacific, was attained. The new territory was divided into two regions, the Amur Territory and the Maritime Province. In 1861 Vladivostok was founded; it became the chief military centre and arsenal of the Russians in the East, until supplanted after 1898 by Port Arthur. During the Boxer uprising of 1900 the Chinese bombarded the town of Blagovieshtchensk on the eastern bank of the Amur. This was followed by the Russian occupation of Manchuria and the chain of events leading to the Russo-Japanese War. Consult: Collins, *Voyage down the Amur* (New York, 1866), and *Exploration of the Amoor* (1864); Andree, *Das Amurgebiet* (Leipzig, 1876).

AMURATH, ä'mōō-rät', or **MURAD' I** (1319-89). Sultan of the Ottoman Empire from 1359 to 1389, succeeding his father Orkhan. He was the first to lead a powerful Turkish army into Europe and in 1361 took Adrianople and fixed there his residence. He completed the subjugation of Asia Minor, and in 1389 his army dealt a crushing blow to the kingdom of Servia in a battle fought at Kossovo. The great Sultan himself was slain on the field of battle, stabbed, according to the common account, by a wounded Servian nobleman as he was surveying the scene of his victory. Amurath was remarkably able, but is said to have been absolutely illiterate, signing treaties by dipping his hand in ink and making a mark with three fingers together, with the fourth finger and thumb stretched wide apart. Consult Hammer-Purgstall, *Geschichte des osmanischen Reiches* (Pesth, 1840).

AMURATH, or **MURAD II** (1403-51). The tenth Sultan of the Turks. He succeeded his father, Mohammed I, in 1421. In 1422 he contended against a pretender, Mustapha (the legitimate Mustapha having previously died), but overcame him without bloodshed. He took Salonica from the Venetians in 1430 and opened the way for subjugating Greece. He went on successfully, on the whole, till 1442, when he was defeated by Hunyady; in 1444 he was obliged to make peace with the Christians. At that time he lost a son, and abdicated in favor of another son, Mohammed, only 14 years old. The Hungarians renewed the war almost immediately, and, hastening from retirement, he overwhelmed them in the battle of Varna, Nov. 10, 1444, where Ladislas, King of Hungary and Poland, fell. He again retired and again came forth to quell an insurrection of the Janissaries. He invaded Albania and was defeated by George Castriota (Scanderbeg); but he retired only to gain a great victory over his formidable adversary Hunyady at Kossovo, in 1448. He was the first Ottoman monarch who caused bridges of great length to be built, and in his reign

poetry, jurisprudence, and theology began to flourish. Consult Lane-Poole, *Turkey* (New York, 1889), and Halil Ganem, *Les Sultans Ottomans*, 2 vols. (Paris, 1901-02).

AMURATH, or **MURAD III** (1545-95). A Sultan of the Turks. He succeeded his father, Selim II, in 1574. He was a feeble, uxorious, superstitious man. His reign was marked by great reverses in Hungary, counterbalanced by territorial gains in Persia and Asia Minor. He made commercial treaties with the Western Powers and was also the first to feel the tyranny of the Janissaries.

AMURATH, or **MURAD IV** (1611-40). A Sultan of the Turks. He succeeded his uncle, Mustapha, in 1623. He is known as "the Turkish Nero," and, like his Roman namesake, he began his reign with great promise; but the mutinous behavior of his soldiers, and the frequent rebellions that marked the first years of his rule, made him a tyrant of extraordinary cruelty. His greatest exploit was the retaking of Bagdad from the Persians (1638), after an assault lasting 30 days, an occasion on which he slaughtered 30,000 of the inhabitants.

AMURATH V (1840-1904), Sultan of Turkey. He was the son of Sultan Abd ul Medjid and was born Sept. 21, 1840. After the accession of his uncle, Abd ul Aziz, in 1861, he was kept in forced retirement, but was placed upon the throne by a revolution May 30, 1876. He showed strong symptoms of insanity, however, and was deposed August 31 of the same year.

AMUSSAT, á'mu'sá', JEAN ZULÉMA (1796-1856). A French surgeon. He entered the army, was assistant surgeon under Esquirol in the Salpêtrière Hospital, and prosecutor at the Paris faculty of medicine. He improved and invented many surgical instruments and was the first to show the importance of torsion of arteries in hemorrhage. He wrote on the nervous system, lithotomy, etc. An operation for opening the large intestine at a point where it is not covered with peritoneum was perfected and first practiced by Amussat. It is still performed, and it bears his name. Among his publications are researches regarding the nervous system (1825), and a memoir on the torsion of arteries (1829), the latter winning a prize from the Institute.

AMY'CLÆ (Gk. Ἀμύκλαι, *Amyklai*). 1. An ancient town of Laconia, on the eastern bank of the Eurotas, 2½ miles southeast of Sparta, in a richly wooded and fertile region. It was early a famous city and after the Dorian conquest seems to have maintained its independence as an Achæan town until the development of the Spartan power. In the neighborhood of Amyclæ have been found important remains of Mycænæan civilization, including the gold cups of Vaphio. At Amyclæ was an ancient temple of Apollo, containing a primitive bronze image of the god (*xoanon*) standing on an elaborate bronze throne. It was the work of Bathycles. Pausanias has given a description of it, important in the history of early Ionic art. At Amyclæ were celebrated annually the Hyacinthia, in memory of Hyacinthus (q.v.). 2. **AMYCLÆ**, or **Amuclæ**, an ancient city on the coast of Latium, Italy, said to have been built by a colony from the Greek Amyclæ. It had ceased to exist before the time of Varro. Tradition said that after many false alarms of the approach of the enemy it was decreed that no one at Amyclæ should announce the approach of an

enemy. Hence, when the enemy did appear, they found it easy to take the town. This story is, however, an invention, to explain the phrase *tacitæ Amyclæ*, which somehow had become proverbial to express profound silence.

AMYG'DALIN (Lat. *amygdala*, Gk. ἀμυγδάλη, *amygdalē*, almond), C₂₀H₂₇NO₁₁, 3H₂O. A crystalline substance existing in the kernel of bitter almonds and in various other plants. It is obtained, by extraction with boiling alcohol, from the paste of bitter almonds, which remains after the fixed oil has been separated by pressure. The alcoholic solution usually contains more or less oil, which must be removed by decantation or filtration; it is then evaporated till a syrup is left, from which the amygdalin may be obtained by the addition of ether; amygdalin is insoluble in ether and is, therefore, precipitated by it from its solutions. Amygdalin has a somewhat bitter taste, but is not poisonous. It may be dissolved in water for any length of time without undergoing any change; but if some emulsin (or some dilute mineral acid) be added to the solution, a sort of fermentation is set up, and the amygdalin gradually undergoes decomposition into benzaldehyde (q.v.), glucose, and hydrocyanic or prussic acid. Now, as emulsin, too, is one of the constituents of bitter almonds, when the paste of bitter almonds is brought into contact with water, a poisonous liquid is obtained. Emmerling has succeeded in producing amygdalin synthetically, from mandelic nitril glucoside and ordinary glucose, by means of maltase, an enzyme contained in yeast.

AMYG'DALOID (Gk. ἀμυγδάλη, *amygdalē*, almond + εἶδος, *eidōs*, shape). A name given in geology to igneous rocks, generally of a basaltic nature, which contain numerous almond-shaped or spheroidal cavities filled with foreign minerals, such as quartz, calcite, or some one of the zeolites. These cavities are regarded as the result of the escape of gases when the rocks cooled, at which time the crystallization of the minerals also took place, these being for the most part similar in composition to the rock.

AM'YL (Lat. *amylum*, from Gk. ἄμυλον, *amylon*, starch + ὕλη, *hylē*, material), C₅H₁₁. A radicle, or group of atoms, found in the molecules of many carbon compounds.

AMYL AL'COHOL. A name applied to eight alcohols having the same molecular composition (C₅H₁₁OH), but more or less different chemical and physical properties. Seven of these alcohols have actually been prepared; the possibility of the existence of the eighth is indicated by the structural theory of compounds. The most important amyl alcohols are the two found in fusel oil, which is produced as an impurity during alcoholic fermentation. Of these, one is called iso-butyl-carbinol, (CH₃)₂CH.CH₂.CH₂OH; the other, secondary butyl-carbinol CH₃.CH²CH(CH₃).CH₂OH. Iso-butyl-carbinol boils at 131° C., has a specific gravity of 0.810, and is optically inactive; it forms the predominating constituent of fusel oil. Secondary butyl-carbinol boils at 128° C., and imparts to fusel oil, of which it forms 10 to 20 per cent, the property of turning the plane of polarized light to the left. The esters (compound ethers), formed by the union of amyl alcohols with some of the acids of the acetic acid series, have highly aromatic odors, resembling those of the apple, the pineapple, the strawberry, the banana, and other fruits. Fusel oil is therefore used in

making artificial fruit essences, which are now generally employed for flavoring syrups, confectionery, etc.

AM'YLENE HY'DRATE. See AMYL ALCOHOL.

AM'YL NI'TRITE. An extremely volatile, pale yellow, oily liquid, with an aromatic taste and fruity odor. It is formed by the action of nitric acid upon amylic alcohol (fusel oil). As it rapidly deteriorates, it is necessarily kept in "small, dark, amber-colored and glass-stoppered vials, in a cool and dark place." The drug is also put into closed glass capsules, or "pearls," which may be crushed in a handkerchief when desired for use. Though occasionally administered internally, it is usually given by inhalation. A moderate amount inhaled causes immediate flushing of the face, a feeling of fullness and pain in the head, tumultuous heart action, labored breathing, and a soft and full pulse. If continued, the head seems distended as though it would burst, and the other symptoms increase. Within a few minutes all these symptoms disappear except the headache, which may last several hours. Poisonous doses cause pallor, irregular breathing, muscular relaxation, and death. Xanthopsia, or yellow vision, sometimes follows inhalation of amyl nitrite, but this is transitory. The chief use of amyl nitrite is to relieve attacks of angina pectoris. It is also valuable for aborting epileptic seizures, especially when there is an aura, or peculiar sensation denoting the approach of one of these. In seasickness, and such spasmodic conditions as asthma, tetanus, or strychnine poisoning, it is occasionally effective. See NITROGLYCERIN.

AMYLOP'SIN. A ferment or enzyme contained in the pancreatic juice which has the property of converting starch into sugar. See DIGESTION; PANCREATIN.

AMYNTAS, à-mîn'tās, I (Gk. Ἀμύντας). King of Macedonia from about 540 to 498 B.C. In token of submission to the Persians about 513 B.C., he presented earth and water to the ambassador, Megabazus, whom Darius, on his return from the Scythian expedition, had left at the head of 80,000 men in Europe. He remained subject to the Persian King.

AMYNTAS II (or **III**). King of Macedonia from about 394 to 369 B.C., son of Philip, the brother of Perdiccas II. He succeeded his father in Upper Macedonia and obtained the crown of the entire country by the murder of the usurper, Pausanias (393 B.C.). Soon after his accession he was driven from Macedonia by the Illyrians, but by the aid of the Thessalians was restored to his kingdom. Afterward he entered into an alliance with the Spartans. He left three sons, Alexander, Perdiccas, and Philip the Great. Some authorities call him Amyntas III; according to them Amyntas II ruled from about 394 to 389.

AMYNTAS III (or **IV**) (-336 B.C.). Grandson of Amyntas II, son of Perdiccas. On the death of his father, in 360 B.C., he was the lawful heir to the throne, which was, however, usurped by his uncle, Philip, father of Alexander the Great. He was put to death in the first year of the reign of Alexander the Great (336 B.C.), who charged him with having conspired against his life.

AMYNTOR, GERHARD VON. A German writer. See GERHARDT, DAGOBERT VON.

AMYOT, à'myô', JACQUES (1513-93). Tutor of King Charles IX, of France, Bishop of

Auxerre, and Commander of the Order of the Holy Ghost, born at Melun, and professor of Greek and Latin at Bourges. He is remembered chiefly for his translations of the Greek romances, *Theagenes and Chariclea* (1547), and *Daphnis and Chloë* (1559), together with *Diodorus Siculus* (1554), *Plutarch's Lives* (1559), and *Plutarch's Morals* (1572). This Plutarch was the basis of North's English version (1575) used by Shakespeare. It was much admired for its personal touch and was used by Corneille. It outranks Amyot's other translations among French classics.

AMYOT, à'myô', or **AMIOT**, JOSEPH MARIA (1718-93). A celebrated French Jesuit and Oriental scholar. He lived as a missionary in China from 1750 to the time of his death. His knowledge of Chinese dialects enabled him to collect many valuable notices of antiquities, history, language, and arts in China. His writings include large contributions to the *Mémoires concernant l'histoire, les sciences, les arts, les mœurs, et les usages des Chinois par les missionnaires de Peking* (1776-1814). His *Dictionnaire Tatar-Mantchou-François* (1789-90) was edited by Langlés.

AM'YRAL'DISM. See AMYRAUT.

AMYRAUT, à'mê'rô', MOSES (MOÏSE) (1596-1664). A French Protestant theologian and metaphysician. He was born at Bourgueil, near Tours. His father set him to study law, and he made rapid progress in the University of Poitiers. He became a licentiate in law (1616), but the reading of Calvin's *Institutes* induced him to leave law for theology, and he studied at Saumur and "sat at the feet of the great Cameron," a pupil as great as his master. There he became a pastor in 1626; in 1633 professor of theology. He was co-professor with Louis Capel and Josua de la Place. Their life-long friendship was beautiful and remarkable, as is their memory as joint authors of the *Theses Salmurienses*. In 1631 Amyraut published *Traité des religions* (Saumur), still a living work; and thenceforward he was foremost in provincial and national synods. The esteem in which he was held was shown when the Charenton synod of 1631 chose him to present to the King the *Copy of the Complaints and Grievances for the Infractions and Violations of the Edict of Nantes*. Before this time all save Roman Catholic deputies had addressed the King on their knees; but Amyraut refused to speak unless he could stand as did the Romanists, and carried the day, his rehearsal charming even his adversaries. His oration is an historic landmark of French Protestantism. He held fast to Calvinism, but with an unusual liberality. He was repeatedly accused, but never convicted, of heresy, because in his *Traité de la prédestination* (1634) he advocates a modification of the strong predestination theory of the Synod of Dort by the "Universalismus hypotheticus," i.e., the theory that God offers salvation to all under the conditions of faith. This is known as Amyraldism and found many adherents—among them Baxter, Andrew Fuller, and the New England divines. He died at Saumur, Jan. 8, 1664. He left many religious works.

AN, or **ON**. The Egyptian name of Heliopolis.

A'NA. A termination added to the names of remarkable men, to designate collections of their sayings, anecdotes, etc.; as in the works entitled *Baconiana*, *Johnsoniana*. Such titles were first used in France, where they became common

after the publication of *Scaligerana* by the brothers Dupuy (The Hague, 1666). In English literature there are many works of this kind. America, also, has its *Washingtoniana*, while Jefferson's *Anas* are well known to students of the history of American politics.

AN'ABAP'TISTS (Gk. ἀναβαπτίζειν, *anabaptizein*, to rebaptize). A term applied generally in Reformation times to those Christians who rejected infant baptism and administered the rite only to adults; so that when a new member joined them, he or she was baptized, the rite as administered in infancy being considered no baptism. Still, because all other branches of the Church considered this a *second* baptism, the term *Anabaptist*, i.e., one who baptizes *again*, was naturally applied to them. The name is, however, not now used by the present Baptists.

The Anabaptist movement was not the product of the Reformation. It was a combination of two factors, the religious and the social, both of which came from times previous to the Reformation. On the religious side it was the successor of the various groups of *brethren* and *Friends of God*—unorganized movements, mostly of humble men, who insisted upon religion as a personal relation between man and God, repudiated the exclusive claims of the Church, and fostered a pure and pious life by Bible reading and, where possible, a single common worship. The social side was the outgrowth of the unrest of the artisans and peasants under the growing oppression of the rich. The Reformation, by casting society into a seething pot, brought all kinds of discontent to the surface. The social unrest soon found expression in the "Peasants' War" (q.v.) (1525), in which demands for both religious and economic reforms were voiced. The religious side was represented in a great number of individuals and loosely organized "praying circles," not separated from the Church, but looking askance upon its ritual and denying miraculous efficiency to the sacraments. This led in time to the denial of infant baptism and the demand for adult baptism only. The logical result of this was the rebaptism of those who had been baptized in infancy, whence the name Anabaptists. The name, however, as so often happens, indicates only an incidental part of the movement. The essential element of the movement was not a question of baptism, but of individual religion as against ecclesiasticism and the connection of church and state. In the theology there was much variety, from a sincere acceptance of the Apostles' Creed in most of north Europe to a frank anti-trinitarianism, especially among the humanists of Italy. Luther, who was conservative in theology and as ardent an advocate of church and state as any Catholic, soon lost sympathy with the Anabaptist movement. Lutheranism represented the upper social classes and the princes; Anabaptism, the peasant and artisan classes, though with a sprinkling of humanists. Organization began in 1524, when delegates from a wide circle met at the house of Hübmaier in Waldshut, and tried to lay down rules of living from the Bible, but did not form a church organization. A second conference was held at Augsburg in 1526, and a general synod at Augsburg in 1527. Here a simple statement of doctrine was framed, much like that now held by the Moravians (q.v.), and an organization formed, which in general was of the Presby-

terian order. From this time Anabaptists, already widespread, grew rapidly till they extended from England to Italy, from the Netherlands and Switzerland to Poland and Hungary. Their opposition to the state churches made them everywhere subject to persecution, often to death with torture. The darkest pages of the Reformation history are those which tell the story of the sufferings of the Anabaptists, under both Catholic and Protestant governments. It is not surprising that so loosely organized a movement of religious enthusiasts should have furnished some cases of fanaticism. It was formerly common to judge the whole movement by these extreme instances, but a better knowledge of the facts has led historians to a more lenient estimate. It is true that some, especially in the early days, dreamed dreams and saw visions and hoped for the speedy coming of the earthly kingdom of Christ. Such were the "prophets of Zwickau" (1520), in Saxony, at whose head was Thomas Münzer (q.v.). They gained a notoriety by coming to Wittenberg, where for a time they won some sympathy from Melancthon. The extreme of fanaticism occurred in Münster, where the Anabaptists laid aside their usual doctrine of non-resistance and defended themselves by force of arms. The leaders were the Protestant minister Rothmann, and the burghers Knipperdolling and Krechting, the tailor, John Bockelson of Leyden, Gerritt Kippenbrock of Amsterdam, a bookbinder, and Matthys of Haarlem. With their adherents they soon made themselves masters of the city. Matthys regarded himself as a prophet, and when he lost his life in a sally against the Bishop of Münster, who was besieging the town, Bockelson and Knipperdolling took his place. The churches were now destroyed, and 12 judges were appointed over the tribes, as among the Israelites; and Bockelson (1534) had himself crowned King of the "New Sion," under the name of John of Leyden. As the siege went on, the strain of the situation grew more severe. Then came one of those strange turns which sometimes occur in a crowd under excitement. John of Leyden proposed that, under the circumstances in the town, polygamy should be allowed. The matter was debated for eight days, and at last his opponents accepted his position. This event is not to be excused, but the whole Anabaptist movement should not be pilloried in history on account of the one moral aberration of the half-crazed population of a besieged town. Anabaptists generally were especially pure in morals. Soon after, the town fell (1535), the leaders were executed with torture, and the kingdom was wiped out in blood.

Most of the Anabaptists were not fanatics, but simple Christians, trying to live according to the New Testament and making much of the "inner light" of the Spirit. Their creed can be learned from Zwingli's attack upon them. See the English translation in Jackson's *Selections from Zwingli*, pp. 123-258 (New York, 1901). This humble folk were treated like criminals, because the authorities recognized that their principles, though in no way sinful, were subversive of the tyrannical government they exercised. Anabaptists must die because they would not submit to the established order. To this day the advocates of the state church look askance at them. At first among them the mode of baptism was not considered important

and so not much discussed. It was by pouring or sprinkling.

A new era for the Anabaptists begins with Menno Simons. (See MENNO.) Surrounded by dangers, Menno succeeded, by prudential zeal, in collecting the scattered adherents of the sect and in founding congregations in the Netherlands and in various parts of Germany. He called the members of the community "God's congregation, poor, unarmed Christians, brothers"; later, they took the name of Mennonites, and at present they call themselves, in Germany, Taufgesinnte; in Holland, Doopsgezinden—corresponding very nearly to the English designation Baptists. This, besides being a more appropriate designation, avoids offensive association with the early Anabaptists. Menno expounded his principles in his *Elements of the True Christian Faith*. This book is still an authority among the body, who lay particular stress on receiving the doctrines of the Scripture with simple faith and acting strictly up to them, setting no value on learning and the scientific elaboration of doctrines. They reject the taking of oaths, war, every kind of revenge, divorce (except for adultery), infant baptism, and the undertaking of the office of magistrate; magistracy they hold to be an institution necessary for the present, but foreign to the kingdom of Christ; the Church is the community of the saints, which must be kept pure by strict discipline. With regard to grace, they hold it to be designed for all, and their views of the Lord's Supper fall in with those of Zwingli; in its celebration the rite of feet-washing is retained. In Germany, Switzerland, and Alsace their form of worship differs little from the Lutheran. Their bishops, elders, and teachers serve without pay. Children receive their name at birth, baptism is performed in the place of worship, and adults that join the sect are re-baptized. (See MENNONITES.)

Almost the only split among the early Continental Baptists on doctrinal grounds was that which took place in Amsterdam in 1664. Arminianism had not been without its influence, especially among the Waterländers, originally more liberal in their views. A leading congregation accordingly divided into two parties, one (Galenists, from Galenus, their leader) advocating freer views in doctrine and discipline; the other (Apostoolists, from Samuel Apostool) adhering to absolute predestination and the discipline of Menno. The liberal party rejected creeds as of human invention, adopted much of the philosophy and theology of England, and exercised no little influence on the intellectual progress of Holland. These two parties gradually absorbed the other sections of the Baptists in the Netherlands; and about the beginning of the nineteenth century a union took place by which all the congregations now belong to one body.

For the modern denomination called Baptists, see BAPTISTS. For the Anabaptists of the Reformation consult Lindsay, *History of the Reformation*, vol. ii (New York, 1907).

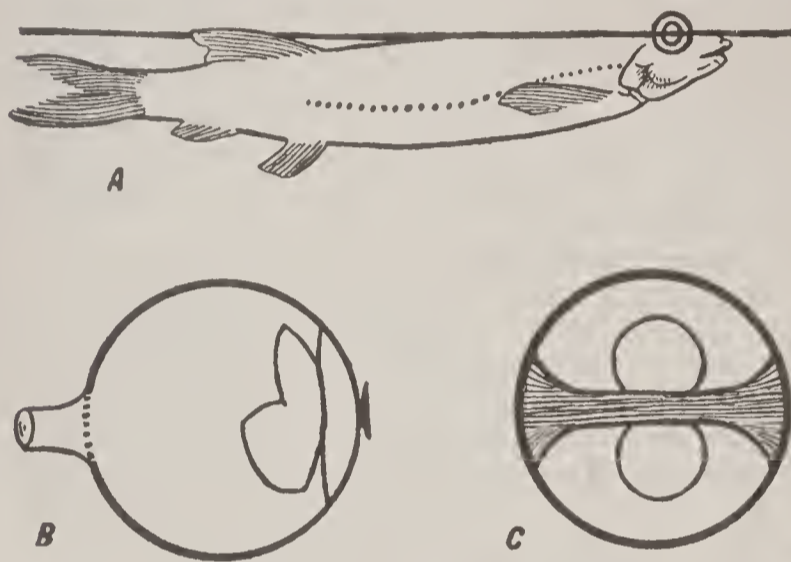
ANABARA, ä-nä'bä-rä'. A river in Siberia, emptying into the Arctic Ocean (Map: Asia, L 1), and forming the boundary between the government of Yeniseisk and the territory of Yakutsk.

A'NABAS, AN'ABAT'IDÆ. See CLIMBING FISH.

ANAB'ASIS (Gk. ἀνάβασις, from ἀνά, *ana*, up

+ βαίνειν, *bainein*, to go). The name of two historical works. 1. The *Anabasis of Cyrus*, written by Xenophon early in the fourth century B.C., which gives a narrative of the unfortunate expedition of the younger Cyrus against his brother, the Persian King Artaxerxes, and of the retreat of his 10,000 Greek allies under the command of Xenophon. See CYRUS THE YOUNGER. 2. The *Anabasis of Alexander*, written by Arrian, 166-168 A.D., and giving an account of the campaigns of Alexander the Great. See ARRIANUS.

AN'ABLEPS (Gk. ἀναβλέπειν, *anablepein*, to look up). A genus of cyprinodont fishes, the four-eyes, remarkable for the incomplete division of the eye into an upper smaller and a lower larger part, the best-known species being *Anableps anableps*. The division of the eye is effected by the growth of two processes of the iris toward each other across the pupil, and a corresponding band of the conjunctiva across the cornea. As they are surface fish, and swim



ANABLEPS TETRAOPHTHALMUS.

A. Attitude in swimming. B. Vertical section of the eye through the lens, showing the lenticular form of the upper half receiving light through the air, and the suborbicular shape of the lower half receiving light through water. C. Diagram of the eye across the front, showing external dark band. (After Tegetmeier.)

with their eyes partly projecting above the water, the upper part serves the purpose of seeing in the air and the lower for seeing in the water. They occur in shallow water along the coast and in the rivers of tropical America. It is impossible for them to dive to any depth and they progress by a succession of short skips or jumps along the surface. They can also make their way very rapidly over mud-flats.

ANAB'OLISM (Gk. ἀναβολή, *anabolē*, something heaped up), and **CONSTRUCTIVE METABOLISM**. Terms applied to the chemical processes of the living body, which result in the formation of more complex compounds from simpler ones. See METABOLISM.

ANAB'RUS. See LOCUST.

ANACAONA, ä'nä-kä'ō-nä, or GOLDEN FLOWER. An Indian princess, sister and wife respectively of Behechio and of Caonabo, caciques of Haiti when Columbus discovered the island (1492). She succeeded her brother as ruler of his tribe, and after the death of Caonabo was on friendly terms with the Spanish until 1503, although many of her subjects revolted under the foreigners' ill-treatment. In the latter year she gave a feast in honor of Ovando, the Spanish Governor, but in the midst of the festivities was arrested and put to death by his order. She composed ballads and narrative poems.

AN'ACAR'DIA'CEÆ (Gk. *ἀνά, ana* [like] unto + *καρδία, kardia*, heart), SUMACH FAMILY. A family of dicotyledonous plants, consisting mostly of trees and shrubs, with acrid, resinous, or milky sap, in some instances very irritating and poisonous. The leaves are usually alternate, rarely opposite; flowers small, polygamous, dioecious, or perfect. This family embraces about 50 genera and 500 species, most of which occur in the tropics of both hemispheres, the only prominent genus indigenous to the United States being *Rhus*; the *Sumach* and *Poison Oak* (q.v.). The genera of the family are grouped into a number of sections, the more important of which are: *Mangifera*, of which *Mangifera* and *Anacardium* are the principal genera; *Spondia*, represented by *Spondias*; *Rhoidea*, the chief genera of which are *Pistacia*, *Rhus*, *Cotinus*, and *Schinus*; and *Semecarpæ*, represented by *Semecarpus*. The entire family abounds in resins and tannins, furnishing the source whence some of the most valuable lacquers, varnishes, and tanning materials are obtained, while some species produce wholesome and pleasant fruits, some of which are extensively grown in the tropics. For detailed economic descriptions, see CASHEW NUT; PISTACIA; MASTIC; HOG PLUM; POISONOUS PLANTS; MANGO; SUMACH, and other names mentioned above.

AN'ACAR'DIUM. See CASHEW NUT.

ANACHARIS, ä-näk'ä-ris (Neo-Lat. from Gk. *ἀνά, ana*, up + *χάρις, charis*, grace). An old name for a genus of plants now called *Elodea* (or *Philotria*), and belonging to the family Hydrocharitaceæ. The best-known species is *Elodea (Anacharis) canadensis*, a native of North America, where it grows entirely submerged in the water of ponds and slow-flowing streams. The plant is a much-branched perennial, with long, slender stems that bear numerous small sessile, linear-oblong leaves arranged either in whorls or oppositely upon the axis. The small flowers appear upon the surface of the water for a short period of time sufficient for pollination, after the accomplishment of which act the female flowers are withdrawn beneath the surface; a case similar to that in the eel-grass (*Vallisneria*, q.v.). This plant was introduced into Great Britain about 1842, and because of its rapid growth has become a serious obstacle to navigation in many of the tide-water streams. *Elodea* is a good example of a plant, innocuous in its native country, which has been introduced elsewhere and found there such a congenial habitat as to enable it to become a most obnoxious weed.

ANACHARSIS, ä'n'ä-kär'sis (Gk. *Ἀναχάρσις*). A Scythian, the brother of King Saurius, said by Plutarch and Diogenes Laertius to have visited Solon at Athens, to have lived with him on terms of intimacy, and also to have been initiated into the Mysteries. From the early fourth century B.C., the tendency to idealize the barbarian peoples of the North assigned to him the highest qualities; his love of learning is said to have caused him to travel through many lands; he was numbered among the Seven Wise Men; and from Aristotle's time many wise sayings and proverbs were attributed to him. They are edited by Mullaeh, *Philosophorum Græcorum Fragmenta* (Paris, 1860-81). Under the title *Voyage du jeune Anacharsis en Grèce*, Jean Jacques Barthélemy, a well-known French author (q.v.), wrote in 1789 a description of Greek life and manners, displaying learning and

good taste, but disfigured by many anachronisms. Anacharsis is made to visit Athens only a few years before the birth of Alexander the Great, and the features of several distinct periods in Grecian history are confusedly regarded as having been contemporaneous. The book, therefore, will not bear a critical examination; but it has contributed its share toward an improved knowledge of ancient life, and has given rise to several similar works, such as the *Gallus* and the *Chari-cles* of Becker.

ANACHARSIS CLOOTS. See CLOOTS.

ANACH'RONISM (Gk. *ἀναχρονίζεσθαι, anachronizesthai*, to refer to wrong time, from *ἀνά, ana*, back, against + *χρόνος, chronos*, time). An error in chronology. Sometimes an anachronism is purposely made for the sake of effect, or to bring certain events within convenient compass for dramatic purposes. Shakespeare, in his *Julius Cæsar*, makes the "clock" strike three; and Schiller, in his *Piccolomini*, speaks of a "lightning-conductor" as known 150 years before its invention. These discrepancies, however, do not seriously injure the general truth of a poetical work. The anachronism is more offensive when, in a work which pedantically adheres to the costumes and other external features of old times, we find a modern style of thought and language, as in the old French dramas of Corneille and Racine. In popular epic poetry anachronism is a common feature. Thus, Achilles is always young; Helena, always beautiful, etc. In their versions of old classic traditions the writers of the Middle Ages converted Alexander, Æneas, and other ancient heroes into good Christian knights of the twelfth century. In the *Nibelungenlied* Attila and Theodoric are good friends and allies, though the latter began to reign some 40 years after the former. At the end of the poem, the heroine, who must have been nearly 60 years old and had passed through great affliction and sorrow, is still the "beautiful Queen Kriemhild." Many ludicrous examples of anachronisms may be found in old Dutch paintings; e.g., Abraham, Isaac, and Jacob in modern costumes, and Adam in Paradise, armed with a musket.

ANACHUANA, ä'nä-chwä'nä. A village and bay, on the northern coast of the Isthmus of Panama, just west of Cape Tiburon.

AN'ACLE'TUS I, SAINT, otherwise CLETUS. Second or third Bishop of Rome. A martyr under Domitian. Others say that he succeeded Clement I as fifth Bishop of Rome, and was martyred under Trajan. His day is July 13.

ANACLETUS II (?-1138). Anti-pope, by name Peter Pierleoni. He sprang from a rich and powerful Roman Jewish family, studied in Paris, became Cardinal in 1116, was chosen Pope in 1130 by a faction of cardinals opposed to Innocent II, and was sustained by the Roman and some other states. He maintained himself at Rome against the arms of Lothaire, the opposition of other kings, and the clergy in general. He died Jan. 25, 1138.

AN'ACOLU'THON (Gk. *ἀν, an*, priv. + *ἀκόλουθος, akolouthos*, following, attending). A term employed both in grammar and in rhetoric to denote the absence of strict logical sequence in the grammatical construction. Such inconsequences, to which some languages lend themselves more readily than others, abound in the classic Greek writers as well as in the Elizabethans who caught their spirit. Languages characterized by grammatical rigidity (Latin,

German, and Russian, for instance) are ill adapted to this kind of license. Of course, in colloquial speech nothing is more common than anacoluthon, but careful writers in all languages shun it. The following from Disraeli illustrates the fault: "Lost in profound reverie, the hours flew on."

AN'ACON'DA (origin unknown; possibly native name). Any large crushing snake, a boa. More especially the great South American water-boia (*Eunectes murinus*), called in Brazil *Sucuriu*, which is closely allied to the boa constrictor, and is sometimes 20 feet long. Its nostrils are capable of being closed while in the water. It haunts the banks of streams in Guiana and Brazil, where it preys on the animals that live in the water or come to the banks to drink. When on land it is rather helpless. It is rich brown, beautifully decorated by a double series of dorsal blotches and with irregular ring-spots along the sides. Consult Mole and Ulrich, *Proceedings Zoölogical Society of London* (1894). See **BOA**, and **PLATE OF BOAS**.

ANACONDA. A city and the county-seat of Deer Lodge Co., Mont., 26 miles west by north of Butte, on the Butte, Anaconda, and Pacific, the Chicago, Milwaukee, and St. Paul, and the Northern Pacific railroads (Map: Montana, C 3). It has parks, a race track, and fair grounds, the Hearst Free Library, two opera houses, and a daily newspaper. Deposits of gold, lead, silver, and sapphires are found in the vicinity, and the city is noted for its copper-smelting works, which have a daily capacity of some 12,000 tons of ore and are the largest in the world. The copper produced by the Washoe Reduction Works, of the Anaconda Mining Co., comprises 10 per cent of the world's output of copper. Railroad shops, brass and iron foundries, machine shops, refractory brick works, and a brewery, further represent the industrial interests. Founded in 1884, when the reduction works were established, Anaconda has developed with the copper industry. The mining company owns all the public utilities. Altitude, 5280 feet. Pop., 1890, 3975; 1900, 9453; 1910, 10,134; 1913 (est.), 12,500.

ANACOR'TES. A city in Skagit Co., Wash., 90 miles north of Seattle, on the Great Northern Railroad, and a port on the Inland Navigation Company, the Pacific Coast Steamship Company, the Alaska Pacific Steamship Company, and the Island Navigation Company lines (Map: Washington, C 2). The leading industries of the city include lumber mills, salmon canneries, cod-fish plants, box factories, oil and glue factories, glass works, a ship yard, etc. Ample water power is available in the Skagit valley, within a radius of 25 miles. Among the notable features of the city are the Carnegie library, Deception Pass, the city park, and Cap Santa Park. The government of the municipality is vested in a mayor and seven councilmen. Pop., 1890, 1131; 1900, 1476; 1910, 4168; 1913 (est.), 6000.

ANAC'REON (Gk. Ἀνακρέων, *Anakreōn*) (c.570-490 B.C.). One of the most esteemed lyric poets of Greece. He was born at Teos, a seaport of Ionia, and spent part of his youth in Abdera (q.v.), to which place most of his fellow townsmen emigrated when their city was taken by the Persians in 545 B.C. He was patronized by Polycrates, the ruler of Samos (533-522), who invited him to his court; and there he sang in light and flowing strains the

praise of wine and love. After the death of Polycrates, he went to Athens (521 B.C.) and was received with distinguished honor by Hipparchus. After the fall of Hipparchus he accepted an invitation from Echeerates, a Thessalian prince, to make his home with him. Great honors were paid to him after his death. Teos put his likeness upon its coins, and Pausanias (q.v.) saw a statue to him on the Acropolis of Athens, which represented him in a half-drunken condition. The Alexandrians knew five books of his poems; but we have only two poems complete, and a few scanty fragments. The collection of poems known as *Anacreontics* gives weak imitations of his work, dating from the Alexandrine period to late Byzantine times; as has been well said, "The extraordinary fame of the Teian bard in modern times is largely due to the admiration of poems which Anakreon did not write, an admiration that is at once vicious on the stylistic side and ignorant of the debased form in which the *Anakreontica* are composed." The genuine fragments are published in Bergk's *Poetæ Lyrici Græci*, vol. iii, 5th ed., Leipzig, 1900). They have been paraphrased in English by Thomas Moore. Anacreon's poems are marked by sweetness, urbanity, exquisite simplicity, and by a delicate and airy touch; he deals chiefly with love and wine, but shows also a marked capacity for satire. See H. W. Smyth, *Greek Melic Poets* (New York, 1900).

ANACREON MOORE. The Irish poet, Thomas Moore, not only translated Anacreon, but wrote English poems in imitation of his beloved master. The following epigram, contained in an after-dinner speech, is said to have given rise to the nickname:

"Oh, weep not for Anacreon dead!
Oh, mourn not for Anacreon fled!
The joys long dead will Time restore
For we have one Anacreon Moore."

ANACREONTICA, ANACREONTICS. See **ANACREON**.

ANACRU'SIS (Gk. ἀνάκρουσις, a pushing up or back). A metrical term adopted in 1798 by Gottfried Hermann (q.v.) as a result of his philosophical study of metrical problems. Stated simply, it means that the first syllable of a line of verse is not to be regarded as anything more than a sort of preliminary to the actual metrical entity, like the upward movement of the bâton of a musician in directing an orchestra. This notion, which has been generally though not universally accepted, revolutionizes the technical structure of both ancient and modern poetry and tends to change what was formerly known as iambic verse into verse that is trochaic. (See **IAMBIC MEASURE**.) Its application may be illustrated by taking the following familiar line from Gray's *Elegy* and "scanning" it according to the older system, and again, by the use of an anacrusis as by Hermann:

× × × × ×
The cur | few tolls | the knell | of part | ing day.

This is an iambic line pure and simple. As Hermann would have it, the first syllable is an anacrusis, and the rest of the line becomes trochaic, thus:

> / / / / / >
The | curfew | tolls the | knell of | parting | day.

It is worthy of remembrance that none of the ancient authorities on metrical questions had

any conception of an anacrusis, and that, when read, the listener is not conscious of any difference between the two lines. The whole matter is purely technical. For practical illustrations see VERSIFICATION.

AN'ACYC'LUS. See PELLITORY OF SPAIN.

AN'ADAR'KO. A city and the county-seat of Caddo Co., Okla., 50 miles from Oklahoma City, on the Chicago, Rock Island, and Pacific Railroad, and on the Washita River (Map: Oklahoma, C 3). Anadarko has two government Indian schools, a fine county court house, a park, and a Chautauqua auditorium. It is in the centre of the richest agricultural county in the State, producing corn, wheat, cotton, alfalfa, and a great variety of vegetables and fruit. Both the water works and lighting plant are owned by the city, power being obtained by means of a dam across the Washita River. The industries of the city include cotton gins, oil and flour mills, and grain elevators. Pop., 1900, 2190; 1910, 3439; 1913 (est.), 4000.

ANADIR, ä'nä-dīr', or ANADIR BAY. A sea or large gulf of northeastern Asia, constituting the northwestern part of Bering Sea (Map: Asia, Siberia, R 2). It is about 480 miles in circumference and about 250 miles wide, and is frequented by whalers.

ANADIR. A river in the extreme northeast of Siberia, rising in the mountain lake Ivashkino. It flows first in a southwesterly and then in an easterly direction, mostly through rocky, snowy regions, for a distance of about 400 miles, and empties into the gulf of the same name, in lat. 64° 40' N. It drains an area of about 115,000 square miles, and the Mayin, the Bielaya, and the Krasnaya are the principal tributaries. Consult Kraemer, "Der Anadyr-Bezirk nach A. W. Olssuffjew," in vol. xlv, *Petermann's Mitteilungen* (Gotha, 1879).

ANADYOMENE, än'ä-dī-ōm'ē-nē (Gk. ἀναδυομένη, from ἀναδύεσθαι, *anadyesthai*, to rise). A name applied to Aphrodite emerging from the sea. The ancients used the word especially to denote a celebrated painting by Apelles (q.v.), representing the goddess as she was rising from the sea, and wringing out her long hair with both hands. It was painted for the temple of Asclepius on the island of Cos. Augustus bought it for 100 talents of remitted taxes and placed it in the temple of Julius Cæsar in the Forum at Rome; by Nero's time it was practically ruined and was replaced by a copy made by Dorotheus. It is frequently mentioned in the Greek Anthology, but the allusions do not furnish the data for accurate reconstruction of the painting. The name is frequently applied to similar representations of Aphrodite rising from the waves or standing in a shell and wringing the water from her hair; the relation of these to the painting by Apelles cannot be determined.

ANADYR, ä'nä-dīr'. See ANADIR.

ANÆ'MIA (Gk. ἀν, *an*, priv. + αἷμα, *haima*, blood) is a depraved condition of the blood, the term covering several distinct disorders, characterized either by a deficiency in volume or in some of the normal constituents. A reduction in the number of red blood corpuscles is called *oligocythemia*; in the white corpuscles, *leucopenia*; *oligochromenia* is applied to a lowered percentage of hemoglobin; while a diminution of the volume of blood is termed *oligemia*. In medicine anæmias are divided somewhat arbitrarily into two general types—*primary*, or *idiopathic*, and *secondary* anæmias. The primary

anæmias, *pernicious anæmia*, splenic anæmia, leukæmia, and Hodgkin's disease—are due to disease of the blood-making tissues, notably the spleen, lymph glands, or bone marrow, and are generally fatal. Pernicious anæmia is a disease of middle life, brought on by chronic indigestion, intestinal poisoning (auto-intoxication), chronic malaria, prolonged mental strain or worry, and other similar causes. The chief blood changes consist in a marked reduction of the number of the red cells, and changes in the heart, liver, and blood-making organs. There are usually great pallor, shortness of breath, weakness, and palpitation of the heart. *Secondary anæmia* is a symptom found in many diseases and conditions, as malaria, hemorrhage, jaundice, poisoning by lead, mercury, copper, or arsenic; further, it may be due to improper food, insufficient sunlight, or to blood-sucking intestinal parasites; or, finally, it may occur during Bright's disease, diabetes, or cancer. The symptoms are similar to those of pernicious anæmia, but less severe. The curative treatment of the secondary anæmias consists in allowing the patient fresh air, good nourishment, and materials which promote the formation of the deficient elements of the blood, such as iron and arsenic. See CHLOROSIS. For "Miners' Anæmia," see ANKYLOSTOMIASIS.

ANA'ËROBES. See RESPIRATION.

AN'ÆSTHE'SIA (Gk. ἀν, *an*, priv. + αἴσθησις, *aisthēsis*, feeling, sensibility, or ANALGESIA). A loss of sensibility to external impressions. Anæsthesia means, properly, the loss of the sense of touch; analgesia, the loss of the sense of pain. The terms are often used interchangeably, and anæsthesia has come to mean the loss of sensibility to all kinds of sensory impressions. Tactile, pain, heat, cold, and muscular senses are those usually affected. All these sensations are received by special sense organs situated on the outside of the body or in mucous membranes. From the sensory end organs the paths for these sensations pass into the spinal cord and thence up to the brain. Disease or injury in any part of the path may produce a loss of these sensations. Thus, if a nerve which contains sensory fibres is injured, the parts whose sensory nerves are detached from the brain lose all sensibility. In a certain rare disease (syringomyelia) there is loss of pain sense and of the sense of heat and cold, but not of tactile sense. Should accident or disease occur still higher up in the sensory area of the brain, or in areas where sensory fibres come together, as in the medulla and internal capsule, one side of the entire body may become anæsthetic. Such extreme grades of anæsthesia are infrequent, but there is almost no area in the body which may not lose its sensibility by accident or disease. Even in "functional" diseases, as hysteria, in which no known changes have taken place in the nervous tissues, loss of sensibility may occur. For *Artificial anæsthesia*, see ANÆSTHETIC. See also SENSATION.

AN'ÆSTHET'IC (for derivation see ANÆSTHESIA). A general term embracing two great groups of anæsthetics: (1) local anæsthetics, affecting a restricted area; (2) general anæsthetics, temporarily affecting the sensibility of the entire body. Cold is one of the safest local anæsthetics, in the form of cold water or cracked ice. Various freezing mixtures, such as ether spray or ethyl chloride spray, are even more valuable, but require skill and experience in use, or the part may be frozen and thus injured. Carbolic acid, creosote, thymol, and vola-

tile oils, containing phenol-like bodies, are local anæsthetics. These, when applied, have the power of paralyzing the sense organs of the skin and mucous membranes. Their use is attended with danger, however, and they should be administered by a physician only. The most important of the local anæsthetics is cocaine (q.v.), which has the peculiar and useful property of being able to paralyze sensory nerves alone. In a weak solution it is injected under the skin, which it renders anæsthetic, relieving pain, as in neuralgia, and permitting operations on the part. Applied to the mucous membrane, it destroys all feeling, and can be used in the eye, ear, nose, mouth, rectum, vagina, urethra, and bladder, to overcome pain or permit operations. Dr. J. Leonard Corning, of New York, in 1885, discovered that when injected in weak solution into the spinal canal, it produced a loss of all sensation below the place of injection. Extensive operations have been performed under spinal anæsthesia, and children have been born without pain to the mother; but there are some serious disadvantages in this medullary narcosis. Eucaine and stovaine have replaced cocaine for this purpose, having been found safer.

It is probable that for thousands of years the natives of India have used Indian hemp for the relief of pain, while the inhabitants of China have used opium from the poppy plant. In all ages and among all peoples, alcoholic drinks have been used to diminish sensibility to pain.

In 1800 Sir Humphry Davy, experimenting with nitrous oxide (q.v.) or laughing gas, suggested its usefulness as an anæsthetic. In 1844 Dr. Horace Wells (q.v.), an American dentist, demonstrated that the gas may be actually employed for painless extraction of teeth. In 1828 Dr. Hickman suggested carbonic acid gas. As early as 1795 Dr. Pearson had used the vapor of sulphuric ether for the relief of spasmodic affections of the respiration. The fact that sulphuric ether could produce insensibility was known to Faraday in 1818 and was shown by the American physicians, Godwin (1822), Mitchell (1832), Jackson (1833), Wood and Bache (1834); but it was first used to prevent the pain of an operation by Dr. Crawford W. Long (q.v.), of Georgia, who removed a tumor from a patient under ether in 1842. Unfortunately Long did not publish his discovery to the medical world and failed to utilize his opportunity. Upon the suggestion of Dr. Jackson, Dr. W. T. G. Morton (q.v.), a dentist of Boston, after experimenting privately, introduced ether anæsthesia into general use in 1846. At the request of Dr. John C. Warren, Morton administered ether in an operation at the Massachusetts General Hospital on Oct. 16, 1846. In December, 1846, Robinson and Liston, in England, operated on patients rendered insensible by the inhalation of ether vapor. This substance was extensively used for a year, when Sir J. Y. Simpson, of Edinburgh, discovered the anæsthetic powers of chloroform (see CHLOROFORM), and introduced the use of it into his own department, midwifery. Since that time chloroform has been the anæsthetic in general use in Europe; but ether is preferred in America, except for children and parturient women. Chloroform should not be given where there is weak action of the heart from disease. No anæsthetic should be given in case of chronic or severe kidney disease. Consult Sir Frederick Hewitt, *Surgical Anæsthesia* (4th ed., London, 1912), and R. W. Cal-

lum, *The Practice of Anæsthetics* (New York, 1909).

AN'AGAL'LIS. See PIMPERNEL.

ANAGNI, à-nä'nyë. An episcopal city in south Italy, situated on a hill 1510 feet above sea level, 36 miles southeast of Rome (Map: Italy, H 6). It is the site of Anagnia which Vergil mentions as "wealthy Anagnia." The city is intimately connected with papal history, as it is the birthplace of four popes, and others here sought asylum in times of persecution. The Cattedrale di Santa Maria is the most noteworthy edifice. It was erected in the eleventh century and was restored in 1350. Its style is pure, and it contains many interesting antiquities. Anagni is the residence of many noble Italian families. Pop., 1881, 8023; 1901, 10,059; 1911, 10,429.

ANAGNIA. See ANAGNI.

AN'AGRAM (Gk. *ἀνά*, *ana*, backward + *γράμμα*, *gramma*, writing). The transposition of the letters of a word, phrase, or short sentence, so as to form a new word or sentence. It originally signified a simple reversal of the order of letters, but has long borne the sense in which it is now used. The Cabalists attached great importance to anagrams, believing in some relation of them to the character or destiny of the persons from whose names they were formed. Plato entertained a similar notion, and the later Platonists rivaled the Cabalists in ascribing to them mysterious virtues. Although now classed among follies, or at best among ingenious trifles, anagrams formerly employed the most serious minds, and some of the Puritan writers even commended the use of them. Cotton Mather, in his elegy on the death of John Wilson, the first pastor of Boston, in New England, mentions:

His care to guide his flock and feed his lambs
By words, works, prayers, psalms, alms, and *anagrams*.

The best anagrams are such as have, in the new order of letters, some signification appropriate to that from which they are formed. It was a great triumph of the mediæval anagrammatist to find in Pilate's question, "*Quid est veritas?*" ('What is truth?') its own answer: "*Est vir qui adest*" ('It is the man who is here'). Anagrams, in the days of their popularity, were much employed, both for complimentary and for satirical purposes; and a little straining was often employed in the omission, addition, or alteration of letters, although, of course, the merit of an anagram depends much upon its accuracy.

Isaac D'Israeli (*Curiosities of Literature*, vol. iii) has a chapter on anagrams, which, as an exercise of ingenuity, he ranks far above acrostics. Among a great many considered by him worthy of record, are the following: the mistress of Charles IX of France was named Marie Touchet; this became *Je charme tout* ('I charm every one').

On a visit to King's Newton Hall, in Derbyshire, Charles II is said to have written on one of the windows, *Cras ero lux* ('To-morrow I shall be light'), which is the anagram of *Carolus Rex*.

Anagrams have now gone out of fashion, or rather have been relegated to the puzzle column of the magazine for the household. And yet even in this century writers have formed their pen-names by recombining the letters of their real names. For example, Bryan Waller Proctor is still called Barry Cornwall; add *poet*, and the anagram becomes complete. Besides D'Israeli,

cited above, consult Wheatley, *On Anagrams* (Hartford, 1862).

AN'ACHEIM. A city in Orange Co., Cal., 27 miles by rail southeast of Los Angeles; on the Southern Pacific and the Atchison, Topeka, and Santa Fe railroads (Map: California, H 9). It is in a fertile valley and has fruit canning and drying interests, and a large trade in oil, oranges, lemons, walnuts, and farm and dairy products. Sugar, beer, wines, and brandies are manufactured. The city owns and operates its water works and electric light plant. Anaheim was settled by 50 German families in 1857 on a coöperative basis, and in 1878 was incorporated as a town. An interesting account of its early history is given in *Nordhoff, Communitistic Societies of the United States* (New York, 1875). Pop., 1900, 1456; 1910, 2628.

ANAHUAC, ä'nä-wäk'. A Mexican term applied to the great central plateau of Mexico, which comprises nearly half of the total area of the Republic. Roughly speaking, it lies between 15° and 31° N. lat. and long. 95° and 110° W., while its altitude ranges between 6000 and 9000 feet. The plateau is the granary and stock-raising centre for the country, whose chief cities are mainly situated upon it. The name "Anahuac" was the Aztec term for all Mexico.

ANAÏTIS, än'ä-ī'tīs. The ancient Persian goddess of waters, whose worship was widely spread in the East in early times. The Avesta (q.v.) celebrates her praise as the celestial stream *Arđvi Sura Anahita* 'the lofty, mighty, and undefiled,' and describes her descent from the heavens. She appears as *Anahata* in the cuneiform inscriptions of the Persian King Artaxerxes II (fourth century B.C.). Her name as *'Anaitis*, *Anaitis*, is in Strabo, Plutarch, and elsewhere, and she became familiar in Greece as Venus Anaitis (*'Aφροδίτη 'Αναΐτις*, *Aphroditē Anaitis*). She was the patron of fecundity and secured for pregnant women an easy delivery. Consult Windischmann, *Die Persische Anahita oder Anaitis* (Munich, 1856), and Jackson, *Iranische Religion*, in Geiger and Kühn's *Grundriss der iranischen Philologie*, vol. ii (Strassburg, 1896-1904).

AN'AKIM (Heb. children of Anak, i.e., the long-necked, a giant). Represented in the Old Testament as a race of giants (Num. xiii. 33; Deut. ii. 10-12, etc.), one of whose strongholds was Kirjath-Arba, or Hebron, in southern Palestine (Josh. xiv. 12-15), but who were spread over the mountains of Judah and Israel. Anakim is an indefinite designation like Rephaïm for miscellaneous groups of the pre-Israelitish inhabitants of Palestine. They are said to have been conquered by Joshua together with the rest of the Canaanitish peoples (Josh. xi. 21), though according to verse 22 a remnant survived in the Philistine cities of Gaza, Gath, and Ashdod.

ANAL'CITE, ANALCIME, or CUBICITE (Gk. *αν, an*, priv. + *ἀλκή, alkē*, strength; refers to its weak electricity when heated or rubbed). A common zeolite mineral, chemically a hydrated silicate of sodium and aluminum. It crystallizes in isometric forms, commonly the trapezohedron. Its lustre is vitreous, its color white, greenish, or faintly red. It occurs with other zeolites.

AN'ALEM'MA (Gk. *ἀνάλημμα*, a support, prop; a sun-dial). A name given to an orthographic projection of a sphere upon the plane of a meridian, the point of sight being assumed at an infinite distance on a line normal to the given plane and passing through the centre of

the sphere. The term was also applied to the sun-dial, but more often to an instrument of brass or wood, on which the above projection could be drawn and which was used for astronomical purposes. The term is further employed to designate a scale, often seen on terrestrial globes, showing the declination of the sun and the equation of time for various days of the year.

AN'ALGE'SIA. See ANÆSTHESIA.

ANAL'OGISTS. See PHILOLOGY.

ANALOGISTS. See ANOMALISTS AND ANALOGISTS.

AN'ALOGUE (Gk. *ἀνά, ana*, according to + *λόγος, logos*, due ratio). A term in comparative anatomy. Organs are *analogous* to one another, or are *analogues*, when they perform the same function, though they may be altogether different in structure; as the wings of a bird and the wings of an insect. Organs, again, are *homologous*, or *homologues*, when they are constructed on the same plan, undergo a similar development, and bear the same relative position, and this independent of either form or function. Thus, the arms of a man and the wings of a bird are homologues of one another. See HOMOLOGY.

ANAL'OGY (Gk. *ἀναλογία, analogia*, equality of ratios). In general, an agreement or correspondence in certain respects between things in other respects different. Euclid employed it to signify proportion, or the equality of ratios, and it has retained this sense in mathematics; but it is a term little used in the exact sciences, and of very frequent use in every other department of knowledge and in human affairs. In grammar we speak of the analogy of language; i.e., the correspondence of a word or phrase with the genius of the language, as learned from the manner in which its words and phrases are ordinarily formed. (See PHONETIC LAWS.) In philosophy analogy presupposes a rule inferred from observation of instances and is the application of this rule to other instances not precisely but somewhat similar. We venture upon this application with more or less confidence according to the degree of ascertained similarity and according to the extent of observation from which our knowledge of the rule has been derived. John Stuart Mill, in his *Logic*, states the formula of analogy in this way: "Two things resemble each other in one or more respects; a certain proposition is true of the one, therefore it is true of the other." What makes analogical reasoning successful at all is the fact that superficial resemblances often point to fundamental identity in type. Analogical reasoning is the assumption of a deeper significance in similarities than our knowledge of the facts warrants. When this assumption is justified by the event, the analogy has been fruitfully suggestive; when it is not, the analogy has been misleading. Even when analogy leads to discovery, it does this merely by suggestiveness; the final establishment of the truth analogically suggested is never accomplished by analogy, but by some stricter logical method. Thus, reasoning from analogy indeed warrants only probable conclusions; but the probability may become of a very high degree, and in the affairs of life we must often act upon conclusions thus attained. Reasoning from analogy, however, requires much caution in the reasoner. Yet even when its conclusions are very uncertain, they often serve to guide inquiry and lead to discovery. Many of the most brilliant discoveries

recently made in natural science were the result of investigations thus directed. (For the "Analogies of Experience" in Kant, see F. Paulsen, *I. Kant*, Eng. trans., 1902. See also Bacon's *Novum Organum*, Aph. ii, 27, Fowler's ed.) In law, reasoning from analogy must often, to a certain extent, be admitted in the application of statutes to particular cases. Upon similar reasoning the practice of medicine very much depends. In literary criticism it is also often necessary for purposes of interpretation, the sense of the author in a passage somewhat obscure being in some measure determined according to passages in which he has expressed himself more clearly. The application of this rule to the interpretation of Scripture is a point of difference between Protestants and Catholics, the latter insisting upon the interpretation of difficult passages by ecclesiastical tradition and authority. Protestant theologians have very generally employed, with reference to this rule of interpretation, the phrase "analogy of faith," deriving it from Rom. xii. 16; but the meaning of the expression in that verse is disputed. The opposite of analogy is *anomaly* (Gk. irregularity); and this term is used not only in grammar, but with reference to objects of natural history which in any respect are exceptions to the ordinary rule of their class or kind. In physiology analogy is similarity of function between organs which are structurally or morphologically different; e.g., the tail of a fish and that of a whale are analogous organs; in this usage analogy is opposed to homology, which refers to the structural similarity of organs that may even perform different functions; e.g., the wing of a bird and the arms of a man.

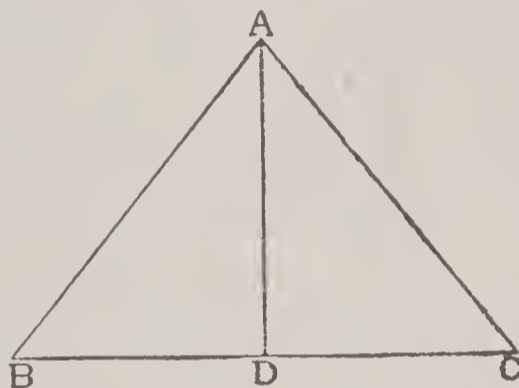
ANALOGY OF RELIGION, THE. The popular name of a famous theological treatise by Joseph Butler, Bishop of Durham. The full title is, *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature*. (For a statement of the leading aim of the *Analogy*, see JOSEPH BUTLER.) The book is in two parts. The first treats of the analogy between natural religion, implying belief in God as the Creator and Governor of the universe, and what is known as natural law; the second discusses the analogy between revealed religion and natural law. Butler's argument is not directed against atheistic or pantheistic opponents of Christianity, but against the deists of his time, notably, Matthew Tindal and John Toland (qq.v.), whose works were written to disprove the necessity of revelation in religion.

ANALYSIS (Gk. *ἀνάλυσις*, a resolution into parts, from *ἀνά*, *ana*, up + *λύειν*, *lyein*, to loosen). A term frequently employed in general philosophy and in the sciences, as the opposite of the term "synthesis." In philosophy the term "analysis" is generally applied to the mental act of distinguishing within a given object its various characteristics; thus, the process by which we recognize that an apple is a thing whose attributes are sweetness, roundness, rosiness, etc., is said to be a process of analysis. On the contrary, the process by which we recognize that various properties together form the characteristics of a single object is termed "synthesis"; thus the consolidation, in our mind, of the several characteristics of an apple into a single concept, is a synthesis. The two processes are complementary aspects of the same mental act. It should be borne in mind that analysis does not really destroy the unity of a given

object; it merely recognizes various distinctions within that unity. Nor does synthesis fuse into indistinguishableness the characteristics it starts with; it correlates them into a unity, but in that unity the identity of each part is fully preserved.

In mathematics the term "analysis" is employed, on the one hand, to denote a potent method of discovery and demonstration; on the other hand, and more or less inaptly, to designate collectively several important branches of modern mathematics.

The method said to be analytic consists in resolving a given relation into its mathematical elements. Analysis in this sense of the term is sometimes applied to the solution of geometric questions. It consists in assuming a certain relation to be the true answer to the question and resolving that relation into simple truths. Euclid (*Elements*, book xiii) formulates this idea as follows: "Analysis is the obtaining of the thing sought by assuming it and so reasoning up to an admitted truth." For example, let the question be, In what ratio does the altitude of an isosceles triangle divide its base?



The simple answer that suggests itself through the inspection of a figure is that the base is bisected. Assume this to be so. In that case the two triangles into which the altitude divides the given triangle are identically equal, because their sides are respectively equal; and therefore the two angles made by the altitude and the base are also equal. But the latter conclusion is an evident truth if we remember that the altitude of a triangle is a line perpendicular to its base. We therefore infer that our assumption was correct and that the base is really bisected. Furthermore, by reversing the above process we can now demonstrate our assumed truth synthetically; i.e., reconstruct it from the simple, admitted truths, to which the analysis has led.

Now, although the demonstrations of geometric theorems, and perhaps most of the theorems themselves, were originally discovered in the manner just indicated, by analysis, most of the ordinary text-book demonstrations are undoubtedly syntheses, for they gradually lead from the mathematical elements—the axioms—to more or less complex truths. Geometry is therefore spoken of as a synthetic science. However, the *reductio ad absurdum*, which is not infrequently employed, is a purely analytical method, differing only in form from the type of analysis considered above. The suggested relation is, namely, assumed to be not true, but false, and this is shown to lead to absurd conclusions—the inference being that the suggested relation is necessarily true.

In designating a part of mathematical science, the term "analysis" is applied, on the one hand, to the theory of functions (including series,

logarithms, curves, etc.), on the other hand, to the mathematics of infinitesimal quantities, comprising the differential calculus, the integral calculus, and the calculus of variations. Algebra, although usually limited to equations, includes in the wider sense of its name the branches just enumerated. Indeed, it is because of their relation to algebra that these branches have been united under the general term "mathematical analysis." Algebra itself, however, is far from being uniformly analytical, and many an instance of pure synthesis may be found in any of the branches of applied algebra, say in analytical geometry. In general, there is no branch of human thought in which the method of analysis, or that of synthesis, is used exclusively. The complete abolition of either of these methods would involve not a small diminution in our power of establishing interesting truths.

In discussions concerning the methods of science, the processes of analysis and synthesis are often erroneously identified with those of induction and deduction. The reason of this lies mainly in the fact that there has been considerable disagreement as to the proper definition of the terms in question. The distinction between the two pairs of antithetic terms becomes perfectly clear, however, if we define analysis as leading from the compound to the elementary, and synthesis as leading from the elementary to the compound; induction as leading from the particular to the general, and deduction as leading from the general to the particular. As thus defined, analysis, as well as synthesis, may be coincident, though not identical, with either induction or deduction. Thus, to turn for an illustration again to mathematics, the ordinary demonstration of a geometric theorem is a deduction; for what can be more general in character than the axiomatic truths from which the theorem is deduced? But the demonstration is also a synthesis; for what can be more elementary than those axioms which are used in reasoning up to the theorem? On the other hand, Newton's binomial theorem, as often demonstrated in text-books of algebra, presents an instance of synthesis coincident with induction. The general relation expressed by that theorem is induced by the examination of a number of particular instances. But the demonstration is also a true synthesis, for it combines a number of relations into one.

More or less extensive discussions of the analytical processes of philosophy may be found in the following works: R. H. Lotze, *Logic* (Eng. trans., Oxford, 1888); F. H. Bradley, *Principles of Logic* (London, 1883); L. T. Hobhouse, *Theory of Knowledge* (London, 1896), and Bosanquet, *Logic* (Oxford, 1888). See also ANALYTIC JUDGMENT; JUDGMENT; KNOWLEDGE, THEORY OF; LOGIC.

ANALYSIS, CHEMICAL. The art of determining the chemical composition of substances. The derivation of the word "analysis" (see preceding article) suggests that chemical analysis necessarily requires the breaking up of substances into their constituent parts. In practice the term is used in a wider sense and is often applied to methods of testing that involve no processes of separation. In most cases, however, one or the other constituent is actually isolated, or some constituents of the original substance, which would interfere with the examination, are actually removed.

An analyst may restrict himself merely to de-

termining what are the constituents of the substance submitted to him; in that case the analysis is *qualitative*. Or he may also determine the relative amounts of some or all of the constituents; then the analysis becomes *quantitative*. In some cases he can only state what elements are present, and in what quantities they enter into the composition of the given substance. The analysis is then said to be *ultimate*. In most cases, however, he further tries to determine in what combinations and in what conditions in respect to their capacity of forming combinations the elements exist in the given substance; and then the analysis is termed *proximate*. The ultimate analysis of organic substances is of great importance and has been brought to high perfection. (See CARBON COMPOUNDS.) On the other hand, the proximate analysis of organic substances is often a task beyond the power of analytical chemistry. Attempts, however, have been made to treat this subject, too, in a systematic manner.

Preliminary Examination of Inorganic Substances. When a substance is submitted for qualitative analysis, the chemist first notes its color and form—the latter with the aid of a simple magnifying glass. The substance is then usually subjected to an examination by means of the blowpipe (q.v.) or the non-luminous gas-flame. (See FLAME.) Blowpipe analysis has been elaborated into a systematic scheme for the detection of all the important metallic and of some acidic radicals, and has proved of great value, especially to the mineralogist. (See MINERALOGY.) The chemist, as a rule, makes only a brief examination to determine the general nature of the substance and to answer such questions as whether water, organic matter, silicates, complex cyanides, large quantities of an easily reducible metal, sulphur and arsenic, are or are not present, such constituents often rendering necessary a modification of the usual scheme of systematic analysis. Heating a small portion of the substance in a closed glass tube reveals the presence of most kinds of organic matter by the smell and separation of carbon, and the presence of water by the drops which condense in the cooler part of the tube. Heating on charcoal with a reducing flame, sometimes with the aid of fluxes, shows the presence of metals that give volatile oxides, the latter forming characteristic coats on the charcoal; and the same test makes it possible to detect any important quantity of an easily reducible metal, metals in the free state being readily identified by their lustre and physical properties. The behavior of the substance when fused with a bead of sodium metaphosphate or of sodium carbonate shows whether a silicate or much silica is present, etc. Often additional special tests are made. For example, gently warming a small portion of the substance with concentrated sulphuric acid may serve to detect volatile acidic substances, such as sulphurous acid and nitrous acid, which might be lost in the regular processes or appear in another form.

If the substance submitted for analysis is a liquid, its color and odor are noted, its reaction toward litmus is ascertained, a portion is evaporated to dryness, and the solid residue, if there is any, is subjected to the preliminary examination as in the case of any other solid.

Qualitative Inorganic Analysis. Before a systematic qualitative analysis of a solid substance can be undertaken, the substance must be

obtained in solution. Sometimes substances submitted for analysis are found to be directly soluble in water. In most cases, however, substances cannot be dissolved unless transformed chemically. Since most chlorides and most inorganic acids are soluble in water, the desired transformation can usually be effected by treating the finely powdered substances with aqueous hydrochloric acid, which converts the metals or metallic oxides present into chlorides, while the acids originally combined in the substance are set free. In case metals (such as silver) are present, which form insoluble chlorides, or in case non-metals (such as sulphur or arsenic) are present, or in case hydrochloric acid does not attack the substance, nitric acid is used. By this the metallic compounds present in the substance are transformed into nitrates, and all normal nitrates are soluble in water; on the other hand, the non-metals present are mostly changed into the corresponding oxygen acids, which are likewise soluble in water—sulphur, for instance, being transformed into sulphuric acid. Many important and familiar substances, however, resist the action of both of these acids. A few, as gold and platinum, will dissolve, forming soluble compounds in a mixture of hydrochloric and nitric acids, the so-called aqua regia, which, on warming, gives off free chlorine. But other substances, such as glass, porcelain, and many natural silicates, resist the action of acids almost entirely. Such substances are usually broken up by melting them with carbonates of the alkali metals and potassium nitrate, or by treatment with hydrofluoric acid. Subsequent treatment with water and hydrochloric acid then usually yields the required solutions.

Let us suppose that we have obtained a clear solution in nitric acid, which may contain all the more familiar metals and is free from organic matter. To this solution we add hydrochloric acid; if we obtain a white solid substance, which does not dissolve in a moderate excess of acid, we know we must have present some or all of the three metals, lead, silver, or mercury in the univalent form, since, of all the more familiar metals, only these three form insoluble, or nearly insoluble, chlorides. The solid precipitate is separated from the liquid by filtration, and we have then on the filter a solid which may consist of any or all of the chlorides of lead, silver, and univalent mercury. A study of the properties of these chlorides shows that lead chloride is freely soluble in hot water, while the other two are not. Therefore, if the mass is treated with hot water, the lead chloride, if present, will dissolve, and can be filtered off while the other two remain behind. The liquid is then examined for lead, which is easily done, since all metals which could interfere with the test have been separated. Further, since silver chloride is known to be easily soluble in aqueous ammonia, while mercurous chloride is converted into a black, insoluble mass containing free mercury, one might assume that treatment of the two chlorides with ammonia solution would effect an easy separation of silver chloride from mercurous chloride. This case, however, well illustrates one of the difficulties of analytical work. If the amount of mercurous chloride is large in proportion to the amount of silver chloride, the metallic mercury set free by the action of ammonia causes the formation of metallic silver, which is practically insoluble in ammonia. If, therefore, ammonia has failed to

extract anything from the precipitate in question, we cannot conclude that silver is absent. We must, then, treat the black mass with a mixture of nitric and hydrochloric acids, which dissolves the black substance containing mercury; while the silver, if at all present in the original substance, remains behind, again in the form of silver chloride, but this time unmixed with anything else. Such cases frequently occur. So often is the behavior of a substance toward a reagent modified by the presence of other substances, that no scheme of analysis worked out at the writing table possesses any value until thoroughly tested in the laboratory.

The filtrate obtained on precipitating out the three metals just spoken of is treated with sulphuretted hydrogen. This precipitates a second group of metals, which are separated from one another by methods analogous to those employed for the first group. The filtrate obtained on precipitating out the metals of the second group is usually treated with ammonium sulphide, and the filtrate from the ammonium sulphide group with ammonium carbonate. Thus the metals that may be present in the original substance are separated into several groups and then special methods are employed to separate and test for the several metals composing each group.

The acid radicals are tested for in a somewhat similar manner, but usually less systematically; because by the time all the metals present have been identified, the analyst usually is able to exclude the possibility of the presence of a large number of acids.

The spectroscope (q.v.) is usually applied to identify the metals potassium and lithium, and is quite indispensable when substances are to be examined to ascertain whether they are in the purest condition possible, since the instrument is capable of revealing the presence of the merest traces of substances. See SPECTRUM ANALYSIS.

The system of analysis usually followed may be carried out mechanically and almost without intelligence, if the substance examined contains only the more familiar metals and acids, and those in considerable quantities. In fact, qualitative analysis is criticised by teachers on this account, when used as a discipline, or as a means of acquiring a scientific knowledge of chemistry. The ordinary scheme, however, overlooks even some elements of common occurrence, as titanium; and when the chemist has to take into consideration small amounts and the less familiar elements, all his chemical knowledge and acuteness find full field for exercise.

It may be seen from the above that the chemist relies on two sets of properties for the identification of a substance: First, those that belong to the substance itself under ordinary conditions; for example, the yellow color and the lightness of sulphur. Such properties may be called properties of condition. On the other hand, if sulphur is heated sufficiently without access of air, it assumes the form of a red vapor; if heated with access of air, it forms with the oxygen of the air a colorless gas possessing a characteristic odor. The first of these changes is physical; the second, chemical. Physical or chemical changes may thus serve to bring out certain properties that are just as characteristic of the substance as the properties of condition. Such properties may be called properties of reaction. They are far more numerous than properties of condition and far more useful to the analyst. In the case of

sulphur, for instance, the properties of condition are only apparent when the sulphur is in a nearly pure form; but the two properties of reaction just mentioned as an example enable us to identify sulphur even when mixed with so much foreign matter that the characteristic color and lightness are quite masked.

Quantitative Analysis. Before beginning a quantitative analysis the chemist must know, in part at least, the qualitative composition of the substance to be analyzed. This knowledge may be obtained by a special qualitative analysis, or, more frequently, from the results of numerous analyses of similar substances.

Methods of quantitative analysis which involve weighing (see BALANCE) are termed *gravimetric*. Methods that involve measuring the volumes of solutions are termed *volumetric*. Finally, methods involving the decomposition of substances by means of an electric current are termed *electrolytic*.

As an illustration of the methods of gravimetric analysis, we may take the analysis of an alloy of silver and copper, such as is used for silver coins in the United States. If high-class weights and a balance are at the disposal of the analyst, not more than half a gram (less than one-fourth of a dime) is the most suitable weight to be taken of the alloy. If the weights or the balance is inferior, a larger amount must be taken, so that the errors of weighing may remain proportionately small. The alloy is dissolved in nitric acid, the insoluble residue (carbon and tin oxide) filtered off and weighed, and the filtrate is treated with hydrochloric acid to precipitate silver chloride, just as in qualitative work. In quantitative work, however, certain precautions must be taken in carrying out this simple operation. Thus, only a slight excess of hydrochloric acid must be added, since silver chloride is somewhat soluble in a large excess of that acid; the liquid must be vigorously stirred and warmed to cause the precipitate to assume a form in which it can be easily filtered and washed, etc. The silver chloride is then filtered off, dried, ignited, and weighed, proper corrections being made for the weight of the ash of the filter. The amount of silver in the alloy is then readily calculated from the weight of silver chloride yielded. The filtrate from the silver chloride contains copper and usually a small amount of lead. The exact amount of copper contained in this filtrate may be best determined by electrolysis. For this purpose the filtrate is first evaporated to dryness, in order to get rid of the hydrochloric acid; the residue is taken up with dilute nitric acid, and the solution thus obtained is subjected to the action of an electric current passing between two carefully weighed platinum terminals immersed in the liquid. The copper is thus deposited in the metallic state on the electro-negative terminal, while the lead is deposited in the form of lead dioxide on the terminal connected with the positive pole. The gain in weight of the terminals gives directly the weight of copper and permits the calculation of the weight of the lead.

Another method, involving the fusion of substances by heat and usually termed the "fire method," is applied chiefly to the determination of metals in ores, and is especially useful in the case of gold and silver ores. Thus, the amount of silver in an ore free from gold may be easily and quickly found by heating a weighed portion of the ore with metallic lead and a little fused

borax in an oxidizing atmosphere. The lead melts, the ore floats on the surface, sulphur and arsenic are volatilized as oxides, the lead is partly oxidized, and the oxide of lead forms a liquid slag with most of the constituents of the ore. At the end of the operation a lead button is obtained, containing the silver. This button is placed on a porous support made of bone-ash (calcium phosphate) and again heated in an oxidizing atmosphere. The lead melts and oxidizes, part of the oxide passes off as gas and part sinks into the porous support, while the silver remains behind as a metallic button, which can be weighed. If gold is present, it is found and weighed with the silver, and then separated by a wet process.

Although gravimetric methods are the more generally applicable, volumetric methods are much more commonly used in the every-day work of the technical analytical chemist. Hundreds of volumetric determinations are made daily in all great manufacturing centres for every one gravimetric determination. As an illustration of volumetric analysis, we may take a method used for the determination of iron in iron ores and applicable to all iron ores found in the United States, except those containing titanium. The process depends on the fact that when a solution of potassium permanganate is added to an acid solution of iron in the ferrous state, the iron is changed into the ferric state, while the strongly colored permanganate is transformed into an almost colorless manganous salt, the volume of potassium permanganate solution thus decolorized being proportional to the amount of ferrous iron present in the acid solution. This fact is made use of by the analyst in the following manner: He first determines the maximum volume of the given permanganate solution which can be completely decolorized by a known amount of iron. For this purpose, say, 300 milligrams of pure iron are dissolved in hydrochloric acid and some metallic zinc is added in order to make certain that all the iron is present as ferrous chloride, FeCl_2 (and not as ferric chloride, FeCl_3). The given permanganate solution is then slowly added from a burette to the solution of iron until the disappearance of the color has ceased to take place. The burette then shows what volume of the permanganate solution can be decolorized by 300 milligrams of iron dissolved as a ferrous salt. Suppose the volume of permanganate solution thus measured is 40 cubic centimeters. Then it is evident that one cubic centimeter of the solution could be decolorized by 7.5 milligrams of iron. A weighed portion of the ore to be examined, say, 500 milligrams of it, is now treated in exactly the same manner as were the 300 milligrams of iron; i.e., the ore is dissolved in hydrochloric acid, its iron is carefully reduced to the ferrous state, and the permanganate solution is slowly added from the burette until no more can be decolorized. Suppose the volume of the permanganate solution decolorized this time is 41 cubic centimeters. Then, since 7.5 milligrams of iron are required to decolorize every cubic centimeter of the permanganate solution, it is evident that the 500 milligrams of the ore must contain 307.5 (i.e., 7.5×41) milligrams of iron and hence the ore is reported to contain 61.5 per cent of iron.

Special Methods of Analysis. Any physical property which depends on the amount of substance present, and is capable of measurement,

may be used for quantitative determinations. Thus, the specific gravity of liquids, which can be readily determined with great accuracy, is extensively used to determine the amount of the dissolved substance in pure or nearly pure solutions. In this manner the amount of alcohol, potassium, or sodium hydroxide, common salt, and, indeed, of all the more familiar salts contained in aqueous solutions, may be determined more readily than in any other way. For determinations of this kind, when no high degree of accuracy is required, the hydrometer is extensively used in chemical laboratories. (See HYDROMETER; ALCOHOLOMETRY.) Among other properties used may be mentioned the coefficient of refraction, the optical rotatory power—much used in determining the strength of sugar solutions (see SUGAR), the intensity of the color or the degree of opacity of solutions and of liquids containing solids in suspension, the electrical conductivity, the boiling point of solutions, the melting point of solids, etc.

Analysis of Gases. The analysis of gases differs from that of solids and liquids in that it is more easy to measure than to weigh gases, and hence the results are usually given in percentages by volume. For many gases reagents are known which absorb the gas readily and completely. Thus, a mixture of carbon dioxide, ethylene, oxygen, carbon monoxide, and nitrogen may be analyzed by bringing a measured volume into contact with caustic potash (which absorbs the carbon dioxide), then with fuming sulphuric acid (which absorbs the ethylene), then with an alkaline solution of pyrogallol (which absorbs the oxygen), then with a solution of cuprous chloride (which absorbs the carbon monoxide), and noting the contraction caused by each treatment. The nitrogen remains behind unabsorbed. Hydrogen and marsh-gas are usually determined by combustion with oxygen. Gases very soluble in water, such as sulphur dioxide, are absorbed in that liquid, and then the amount dissolved is determined by a volumetric process. Carbon dioxide in air offers a special case. As in normal air only 3 parts in 10,000 are present, the ordinary process of measuring the volume before and after treatment with caustic potash requires special apparatus and great care to get good results. Usually a large volume is treated with a measured quantity of a solution of barium hydroxide of known strength, a portion of the barium hydroxide being thus converted into insoluble barium carbonate, and the rest estimated volumetrically.

When the highest degree of accuracy in gas analysis is required, the gases must be confined over mercury; further, only solid absorbents must be used, and careful corrections must be made for changes of pressure and temperature. When water is used to confine the gas, some inaccuracy is introduced, since all gases are more or less soluble in water. In technical work, however, a very high degree of accuracy is but rarely required. The technical analysis of gases has assumed great practical importance, owing to the extension of the use of gaseous fuels.

Accuracy. The accuracy of analytical work varies within wide limits, according to the purpose which an analysis is intended to serve. The most accurate analyses are those made to determine the proportions by weight, in which the various elements unite with each other. Thus, the proportion in which silver and chlorine unite forms one of the best determined constants of

nature. In determining the proportion in which magnesium unites with chlorine, a series of determinations has been obtained agreeing so perfectly with each other that a loss or gain of only one-twentieth of a milligram of the magnesium chloride analyzed corresponds to the difference between the highest or lowest results and the average. No such accuracy is attainable in commercial or technical work. Nor, if attainable, would it be of any value, since it is but seldom possible to obtain samples representing precisely the average composition of large quantities of material.

The aim of the commercial and technical analyst is usually, not to attain extreme accuracy, but to obtain results which he knows to be correct within certain limits. Thus, if an analyst is required to find the percentage of copper in a sample representing a large cargo of ore, in order to fix its commercial value, he can determine the copper by the electrolytic method to within about one part in 400 without undue expenditure of time or labor. If the object of the analysis is to enable the superintendent of the smelting furnace to make up charges of a suitable content of copper, a much quicker volumetric process is used; the results are then less accurate than those of the electrolytic process, but still much more accurate than is necessary for the purposes of the smelter. When it becomes necessary to determine the amount of substances which occur in relatively very small quantities, it is impossible to avoid relatively large errors. For instance, in determining the amount of phosphorous in a specimen of steel, where the total amount is only about one part in 1000, the analyst is not surprised to find that, in spite of all care, differences of 2 per cent occur between the results of determinations made carefully and under exactly the same conditions.

History. Systematic chemical analysis dates only from the latter half of the eighteenth century, although chemists of an earlier period had accumulated observations which made it possible to test for the presence of many substances. Bergman (1735–84) first attempted to give a plan for systematic qualitative analysis of inorganic substances in the wet way. Until the work of Lavoisier (1743–94) had shown the importance of relations by weight, quantitative determinations attracted little attention, although such determinations were by no means entirely wanting. After the triumph of Lavoisier's views, the importance of quantitative analysis was fully seen; and the labors of Klaproth (1743–1817), Proust (1755–1826), and Vauquelin (1763–1829) rapidly enriched chemistry with new methods. But it is to Berzelius (1779–1848) that quantitative analysis owes the heaviest debt. Berzelius published tables of the atomic weights of all the elements well known at that time, and some of his values for these important constants have scarcely been improved on since. In the course of these researches an immense number of new methods were developed. Two of his pupils, Heinrich Rose (1795–1864) and Friedrich Wöhler (1800–82), not only added to the methods in use, but published comprehensive works on inorganic analysis. The final edition of Rose's work, published after his death by his pupil, R. Finkener, remains an invaluable work to the analyst of to-day. Although K. R. Fresenius (1818–97) added many new methods, his great service, which secures

him a conspicuous place in the history of analytical chemistry, was the collection and comparison of the various methods in use, the publication of text-books, which have formed the models of most others since published, and the founding of a periodical devoted to analytical chemistry. The last editions of his standard works are in the hands of every analyst.

Volumetric analysis was introduced by Gay-Lussac (1778-1850); but although he gave the first of his important processes to the world as early as 1824, it was not until the publication of Fr. Mohr's text-book on the subject that volumetric analysis began to rank in importance with gravimetric methods. The ultimate analysis of organic bodies was attempted with some success by Lavoisier and Berzelius. Gay-Lussac, in 1815, introduced the use of cupric oxide, and Liebig (1803-73) gave the process essentially its present form. Dumas (1800-84) introduced, in 1830, the method for the determination of nitrogen by direct measurement of the liberated gas, which is still preferred in strictly scientific work to the easier method devised by Kjeldahl.

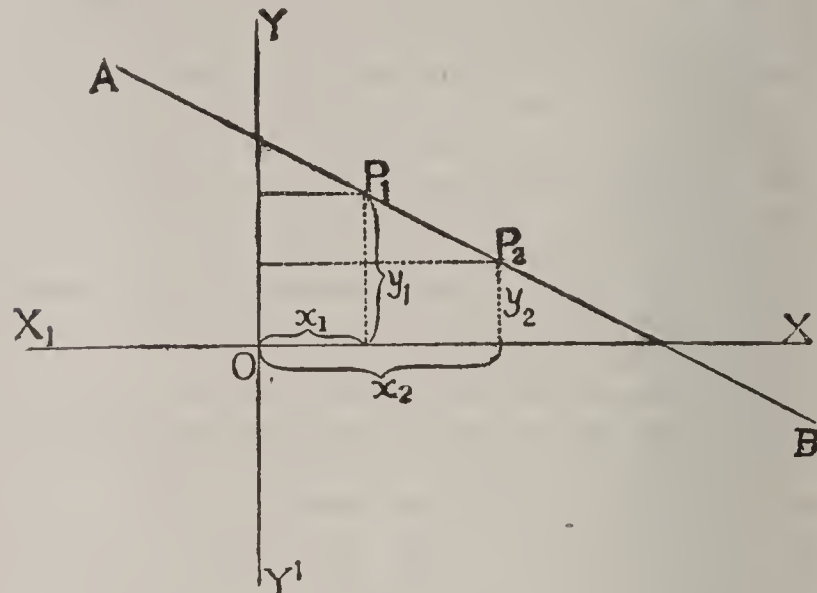
Many attempts were made to analyze gases in the eighteenth century and in the beginning of the nineteenth, but it is to Bunsen (1811-99) that we owe the perfection of the methods at present in use for gas analysis. The first edition of his text-book, *Gasometrische Methoden*, was published in 1857. The improvements since that time have been principally in the direction of adapting the methods to rapid work for technical purposes.

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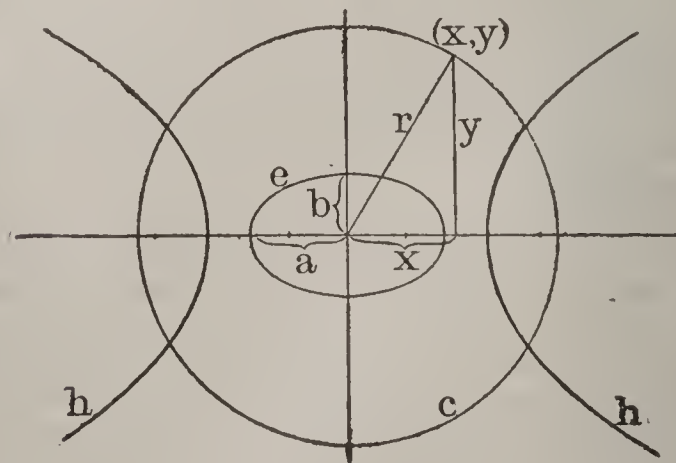
AN'ALYT'IC GEOM'ETRY. Geometry treated by means of algebra. Geometric conditions are expressed by equations which, after certain transformations, are interpreted again in geometric concepts. The powerful algebraic method

is thus made use of for discovering and demonstrating in a simple and easy manner the most complicated relations existing between quantities in space.

The interpretation of geometric relations in algebraic terms is effected by the use of some system of coördinates (q.v.). The primitive system of coördinates, called rectangular coördinates, is due to Descartes (Lat. *Cartesius*), from which fact they are often called Cartesian. In this system the position of a point (as P_1 ,



in the figure) is determined by its distance from the fixed axes XX_1 and YY_1 in the plane, called *axes of coördinates*, which intersect at right angles in a point O , called the *origin*. The distance x_1 of P_1 from YY_1 is called the *abscissa* of P_1 , and the distance y_1 from XX_1 is called the *ordinate*. The two lines x_1, y_1 , are called the *coördinates* of P_1 . Similarly, the coördinates of P_2 are x_2, y_2 . P_1, P_2 , or the points $(x_1, y_1), (x_2, y_2)$ are sufficient to determine the straight line AB . The algebraic equation (q.v.), $y = ax + b$, a, b , being constants, will be satisfied by various values of x and y . The various values of x , as x_1, x_2, x_3 —taken with the corresponding values of y , as y_1, y_2, y_3 —will represent a series of points $(x_1, y_1), (x_2, y_2), (x_3, y_3)$, lying in a straight line. That is, an algebraic equation of the first degree is represented by a straight line. In a similar manner an equation of the second



degree is represented by a curve. In the figure, c is a circle whose equation is $x^2 + y^2 = r^2$, r being the radius of the circle. This is evident by reference to the figure, since the coördinates of any point (x, y) form the sides of a right-angle triangle of hypotenuse r , so that $x^2 + y^2 = r^2$. The curve c is an ellipse whose equation is $b^2x^2 + a^2y^2 = a^2b^2$, a being the semi-major axis and b the semi-minor axis. The curve h is a hyperbola whose equation is $b_1^2x^2 - a_1^2y^2 = a_1^2b_1^2$. If the equations $x^2 + y^2 = r^2$ and $b_1^2x^2 - a_1^2y^2 =$

$a_1^2 b_1^2$ are solved for x, y , their roots are the coördinates of the points of intersection of the curves c, h . These values may be real or imaginary; if real, the curves cut in real points, as in the case of c, h ; if imaginary, the curves are said to cut in imaginary points, as in the case of e, h .

The practical work of plotting a curve may be explained by referring to a particular example; thus, to represent graphically the equation $2x^2 - 3y^2 = 10$. Rearranging and solving the equation for $y, y = \pm \frac{1}{3} \sqrt{6(x^2 - 5)}$. Therefore, by giving x various values (noticing that $x^2 > 5$ for real values of y) we have corresponding values of y as follows:

$$\begin{aligned} x &= \pm \sqrt{5}, \pm \sqrt{6}, \pm \sqrt{7}, \pm \sqrt{8}, \pm \sqrt{9}. \\ y &= 0, \pm \frac{1}{3} \sqrt{6}, \pm \frac{2}{3} \sqrt{3}, \pm \sqrt{2}, \pm \frac{2}{3} \sqrt{6}. \end{aligned}$$

Taking the approximate square roots, and laying off the abscissas and ordinates as indicated, and then connecting the successive points, the graph is an hyperbola, like h shown in the figure.

The power of the analytic forms to express geometric relations may be seen from the following: Let $z_1 = 0$ and $z_2 = 0$ represent the equations $a_1 x^2 + b_1 y^2 - c_1 = 0$ and $a_2 x^2 + b_2 y^2 - c_2 = 0$. Any values of x, y satisfying these two equations will evidently satisfy the equation $(a_1 x^2 + b_1 y^2 - c_1) - k(a_2 x^2 + b_2 y^2 - c_2) = 0, k$ being any constant. But this equation is $z_1 - k z_2 = 0$. Hence, if $z_1 = 0, z_2 = 0$ are the equations of any two curves, any point common to the two satisfies the equation $z_1 - k z_2 = 0$, and, therefore, this is the equation of a curve passing through all intersections of the given curves. In the same way, equations of any degree may be represented and discussed.

The position of a point in space of three dimensions may be expressed in terms of its distances from three fixed planes. In this way the properties of spheres, ellipsoids, and other solids are expressed by equations. In space of four dimensions the coördinates of a point are (x, y, z, w) , and in space of n dimensions $(x, y, z, \dots; n$ quantities), although we cannot draw the figures.

The ellipse, hyperbola, and parabola, being sections of a right circular cone, are known as *conic sections* (q.v.). They were chiefly investigated by purely geometric methods until the appearance of Descartes's *Discours* (1637). In the extensive development of analytic geometry since Descartes, a large number of coördinate systems have been introduced, the most important being the polar, generalized, homogeneous, Lagrangian, Eulerian, barycentric, and trilinear coördinates.

The most comprehensive English works are those by Salmon, *Treatise on the Conic Sections* (Dublin, 1879); *Higher Plane Curves* (1873); *Treatise on the Analytic Geometry of Three Dimensions* (Dublin, 1874). Other noteworthy works are: R. F. A. Clebsch, *Vorlesungen über Geometrie* (Leipzig, 1876); M. Chasles, *Traité de géométrie supérieure* (Paris, 1880); and among recent elementary works are those of C. Smith, Briot, Bouquet, Townsend, Stande, Niewenglowski, and Seott. For a further discussion, see GEOMETRY; COÖRDINATES.

ANALYTIC JUDGMENT. In Kantian philosophy, a judgment in which the predicate is the definition (q.v.) or part of the definition of the subject. All other judgments are synthetic. The distinction between analytic and synthetic judgments is open to serious objec-

tions if the distinction is to be made absolute. Concepts (q.v.) vary from mind to mind, and even in the same mind from time to time. To the laboratory chemist, perhaps the most essential mark in the concept water is expressed in the formula H_2O ; i.e., water is conceived to be a chemical union of oxygen and hydrogen in definite proportions. But the non-scientific man may have a clear idea of what he means by water and can perhaps define his concept. In such a case the definition would not include any reference to oxygen and hydrogen. Thus, the judgment that water is a certain chemical combination of oxygen and hydrogen, while an analytic judgment for the chemist, may be a synthetic judgment for the person who has not yet studied chemistry. Analysis and synthesis in logic are concomitant aspects of the same operation; every analytic judgment may be viewed as at the same time synthetic, and every synthetic judgment is also analytic. Consult E. Caird, *The Critical Philosophy of Immanuel Kant* (2 vols., New York and London, 1889). See the authorities referred to under ANALYSIS.

AN'ALYT'IC LAN'GUAGES. See PHILOLOGY.

AN'ALY'ZER. That part of a polariscope (q.v.) which is used for examining light after it has been polarized. (See LIGHT.) It may be a movable mirror, a plate of tourmaline, a doubly refracting crystal, or a Nicol prism. The latter is most frequently employed for this purpose.

ANAM'. See ANNAM.

ANAMALAI, a-ná-má-lí', HILLS. A mountain chain in south India, in Coimbatore district, Madras. It is a continuation of the western Ghats below the Palghat Pass and contains several lofty peaks. Valuable teak forests are on their sides, and there are many wild beasts.

ANAMIRTA, an'á-mir'tá. See COCCULUS INDICUS.

ANAMMELECH, a-nám'ê-lêk. A divinity worshiped by the inhabitants of Sepharvaim, who were deported to Samaria (2 Kings xvii. 31). It was probably the goddess Anath, the spouse of Melek. She may have been identical with the Anathyaho, or Anath, spouse of Yaho, worshiped by the Jews of Elephantine in the fifth century B.C. See ELEPHANTINE PAPYRI.

ANAMORPHISM. See METAMORPHISM.

AN'AMO'SA. A city and the county-seat of Jones Co., Iowa, about 40 miles (direct) southwest of Dubuque, on the Wapsipinicon and Buffalo rivers, and on the Chicago and Northwestern, and the Chicago, Milwaukee, and St. Paul railroads (Map: Iowa, F 2). It is the seat of a State reformatory. Anamosa has a considerable trade in building stone and manufactures school supplies, butter tubs, hoods, and spades. The city owns its water works. Pop., 1900, 2891; 1905, 2878; 1910, 2983.

ANA'NAS. See PINEAPPLE.

AN'ANI'AS (Gk. 'Avavias, transliteration of Heb. word, 'Yahwe hath been gracious'). 1. One of the members of the early Church at Jerusalem who conspired with his wife, Sapphira, to make a false statement respecting their gift of property to the community of the brethren and was, with her, struck dead (Acts v. 1-11). 2. A disciple at Damascus mentioned in connection with Saul's experience in that place (Acts ix. 10-17; xxii. 12-16). 3. A high priest at Jerusalem, mentioned in connection with Paul's appearance before the Sanhedrin and

later, before Felix, at Cæsarea (Acts xxiii. 2-5; xxiv. 1; cf. Josephus, *Ant.* xx, 6. 2).

ANANIEV, or **ANANYEV**, à-nän'yěf. A town in the government of Kherson, Russia, about 220 miles northwest of Kherson, on the banks of the Tiligula, 95 miles north of Odessa (Map: Russia, C 5). There is little manufacturing, and the only trade is in agricultural products. It has a mixed population of Russians, Jews, and Rumans, numbering in all about 17,000 in 1897, as against 14,200 in 1885. Ananiev was annexed to Russia in 1792.

ANAPA, à-nä'pá. A small seaport on the north coast of the Black Sea, in the Kuban territory, Russia (Map: Russia, E 6). An old rampart, now serving as a promenade, is a feature of the town. A trade in grain and fish is carried on. Founded by the Turks as a fortress in 1781, Anapa was repeatedly attacked by the Russians in their wars with Turkey. It was finally taken and annexed in 1829. In 1854, at the approach of the allied fleet, Russia evacuated it, after destroying its fortifications. Pop., about 7000.

AN'APÆST (Gk. ἀνάπαιστος, *anapaistos*, struck back, i.e., a dactyl [q.v.] reversed, from ἀνά, *ana*, back + παίειν, *paiein*, to strike). The name of a measure, or foot, in Greek verse, consisting of two short syllables and one long syllable; thus — — —. It has been called the marching rhythm, as the language of the chorus in Greek tragedy fell into anapæsts on entering or leaving the orchestra. It was also the prevailing measure in the parabasis of Aristophanic comedy, corresponding to the modern topical song. By analogy, the name is also employed to designate in modern verse a trisyllabic measure of two unstressed syllables followed by a stressed syllable; for example: "I am món | arch of áll | I survéy." See VERSIFICATION.

ANAPHRODISIACS, àn-àf'rò-diz'í-àks (Gk. ἀν, *an*, priv. + ἀφροδισιακός, *aphrodisiakos*, pertaining to Aphrodite, goddess of love). Substances used to lessen the sexual desire. In the first place, all causes of genital irritation should be removed. Careful cleansing should be insisted on, and in many cases circumcision is needed. Saccharine or highly acid urine should be corrected. Distention of the bladder should be avoided if possible. Vesical calculus, worms, hemorrhoids, and anal fissure may all act as causes of sexual excitement and should be treated if present. Constipation should be relieved. The clothing, especially at night, should not be too warm, and the bed should be hard. The diet should be restricted in amount and chiefly vegetable, while spices and stimulants of all kinds should be avoided. Hard mental work and abundant exercise, especially with the arms, are strongly indicated. Ice, applied locally, and cold baths, local or general, are very potent. Besides these measures, some drugs are of value. The best are probably the bromides. They should be given in full doses, and if necessary pushed to the physiological limit. Tobacco, conium, gelsemium, and belladonna are valuable in certain individuals. The nauseants are valuable temporary expedients, but cannot be used in a prolonged treatment. It must be remembered that nymphomania and satyriasis are due to cerebral conditions and occur during attacks of insanity or during delirium produced by alcohol and other drugs.

ANAPHYLAXIS. A hypersensitive condition induced in certain animals or individuals

by the injection of horse serum or other foreign albumen. If a guinea pig is injected with a small dose of horse serum and after a certain interval receives a second dose, symptoms of severe and often fatal intoxication ensue. The first dose produces no disturbance, but renders the animal abnormally sensitive to a second injection. Anaphylaxis is often confused with serum sickness, to which it has some relation. The use of antitoxin or other serums is sometimes attended by unpleasant phenomena, such as fever, urticaria, itching, œdema, joint pains, glandular enlargements, etc., but these symptoms come on after a single dose. Repeated injections of antitoxin, however, predispose an individual to serum intoxication. See RICHET, CHARLES.

ANARCHIDAS, à-när'kī-das. See WOLF-FISH.

AN'ARCHISM (Gk. ἀν, *an*, priv. + ἀρχή, *archē*, power, sovereignty). A system of social doctrines, and a propaganda based thereon, the essential features of which are the abolition of all constituted authority and the complete emancipation of the individual from every form of control, political, social, or religious. The social state which anarchism seeks to realize is denominated anarchy, a term which connotes, according to the expositors of anarchistic doctrines, not disorder, as in the popular conception, but the most perfect conceivable social order.

On the political and moral side anarchism is antithetical to socialism, as the latter term is commonly understood. Anarchism demands the utter abolition of the state, while socialism would not merely make use of the state for purposes of social reorganization, but would endow it with far greater powers than it possesses at present. Socialism, its orthodox supporters claim, would greatly reduce the importance of the judicial functions of the state, since with the abolition of private property the greater number of disputes and crimes that now occupy the courts would disappear. The administrative functions of the state, on the other hand, would be vastly increased in importance, since it would undertake the management of all productive property, determine the degree in which wants are supplied, and regulate the distribution of the productive resources of society. According to the anarchist view, the socialistic system would destroy liberty and is therefore scarcely preferable to the existing order. In the words of Bakunin "liberty without (economic) socialism is equivalent to privilege, injustice; socialism without liberty amounts to slavery and brutality."

In party organization and tactics socialism and anarchism differ radically. Socialistic parties are closely organized, as a rule; the party platform is held to be binding upon all members, and heretics are visited with prompt expulsion. Anarchism has no binding program, no tests of regularity. Each anarchist is a law unto himself. In practice the anarchists form small groups or circles, which meet for discussion and for the working out of plans of action. The meetings are usually secret, and membership in the group is rarely made public. This is chiefly a result of the hostility of the public authorities which in most countries carry on a more or less consistent policy of suppressing anarchism. The groups in the several cities are federated loosely, sometimes along national, but more frequently along international lines. Propaganda is carried on partly by lectures, partly

by pamphlets secretly printed and distributed through subterranean channels, partly by newspapers. The latter are liable to frequent suppression by the public authorities and change their names and places of publication with bewildering rapidity.

On the economic side anarchism is closely related to socialism. Both anarchism and socialism demand the abolition of private property in the means of production. As there is a socialistic school that would carry the principle of socialization even to goods for consumption, so there is an anarchistic school that would abolish all private property whatsoever. In both schools the main tendency is to limit socialization to the means of production. Both schools look upon the present economic system as a product of historical forces that are almost spent and believe that a revolution is impending. Both schools agree in forecasting a state in which production will be carried on for the common good of those engaged in the actual work of producing. Socialists, however, look upon the coöperative state as an organization dominated by the collective will expressed in political terms. The anarchistic principle of organization is free association based upon mutual interests. According to the anarchistic doctrine, every considerable enterprise will be carried on by a group, the membership of which will be continually changing, as men find that interest or whim draws them elsewhere. But it is assumed that under anarchism interests would soon reach an equilibrium, and economic society would become extremely stable and orderly without the slightest interference with individual liberty.

Organized socialism repudiates the idea that there is any relation between socialism and anarchism, and in the history of the socialistic movement there have been frequent conflicts between the two principles. The issue was first drawn in the Congress of the International Workingmen's Association at Basel in 1869, when the representatives of Marx routed Bakunin and his followers. In 1872, at the Congress of The Hague, Bakunin and his followers were expelled from the association. Since that time there have been periodic expulsions of anarchistic elements from the social democracy in most of the countries of northern Europe. In the United States also anarchism has been generally overthrown by socialism. In Italy, Spain, and Greece, as well as in Latin America, the anarchistic element is dominant in the socialistic party. Anarchistic elements also appear to be making head in France and Belgium, under the form of syndicalism (q.v.), and in the United States in the Industrial Workers of the World (q.v.).

History of the Theory. Greek philosophy, while in its main currents rather socialistic and certainly constructive, was not without its representatives of extreme individualistic theory (Zeno, and among the early Christian philosophers, the Gnostics). A mystical theory of the rights of the individual, which resembles idealistic anarchy, was held by some of the Christian writers of the Middle Ages (Joachim, 1200; Amalric of Bène; the Adamites, 1421; Chelcicky, 1420; and others). The first modern writer of scientific repute is Godwin, who, in his *Political Justice* (1793), proceeds on the doctrine of natural rights and regards all government as a sort of necessary tyranny, to be re-

duced to its lowest terms. This doctrine can be traced through a large number of writings, down to Herbert Spencer's ideas of liberty and the sphere of the state. As a social movement anarchism received its first impetus from Proudhon (q.v.). Proudhon thought he saw in anarchy the only way to free the laborer from the encroachments of the capitalist and to guarantee to every man the right to development. Property, in the sense of income-yielding wealth, he described as robbery and advocated its abolition. The state also should be abolished. Individual or associated enterprise, assisted by gratuitous credit provided by mutual associations, formed the basis of his scheme of economic reorganization. Although Proudhon was regarded by the authorities as a dangerous revolutionist, he deprecated all forms of violence and placed his reliance chiefly in education as a means of social reform. Proudhon's ideas found disciples in Germany in Moses Hess, who published *Philosophie der That* and *Sozialismus* (1843), and Karl Grün, both of whom developed the better side of Proudhon's teaching and proposed needed radical reforms. Anarchistic doctrine assumed its later violent form under the hands of Bakunin (q.v.), who from 1861 to his death in 1876 carried on an extraordinary propaganda and organized a following throughout Europe. Bakunin demanded the abolition of the state and of all forms of property and the reorganization of society on the basis of a federation of communes. Revolutionary anarchism gained a considerable number of adherents in Germany through the propaganda carried on by "Max Stirner" (Johann Kaspar Schmidt), who proposed to abolish the state and private property and to erect a new social order upon a basis of individual interests—"a union of egoists." Two disciples of Bakunin, Prince Kropotkin and Elisée Reclus, have made important contributions to the theory of economic organization under anarchy. In the United States Proudhon's doctrine was taken up by B. R. Tucker, of Boston, who published a translation of Proudhon's *What is Property?* (1876), and *Economic Contradictions* (1888), and also a translation of Bakunin's *God and the State* (1883). Tucker edited a periodical entitled *Liberty*, which began publication in Boston in 1881, but was afterward removed to New York City.

Propaganda of the Deed. The point of chief interest in anarchistic tactics is the employment of violence especially against rulers and high officials of government, euphemistically described by anarchists as "the propaganda of the deed." In 1876 two Italian followers of Bakunin, Carlo Calfiero and Enrico Malatesta, urged, in the Congress of Berne, that revolution is the only efficient means of anarchistic propaganda. In the following year an uprising of Neapolitan peasants, apparently instigated by Calfiero and Malatesta, occurred near Benevento. In 1878 two anarchistic attempts were made upon the life of Emperor Wilhelm I, and in 1878 and 1879 attempts were made to assassinate Alphonso XII of Spain. King Humbert of Italy narrowly escaped assassination in 1878. The propaganda of the deed was adopted by the French anarchists in 1882. Dynamite was employed for the first time by anarchists around Montceau in the conduct of a strike.

In March, 1892, there was a series of explosions in France. For one of these Ravachol was executed (June 11, 1892), and others im-

prisoned. There were serious disturbances and explosions in Spain and Italy. In February, 1893, bombs were exploded at Rome. At Barcelona, on September 23, a bomb was thrown into a group of staff officers at a military review, which wounded several officers, one of whom was Captain-General Martinez Campos, and killed one guard. For this, Codina and five accomplices were shot May 21, 1894. A general conspiracy was unearthed at Vienna, September 23. On November 7 a bomb was thrown into the pit of a Barcelona theatre, which killed 30 and wounded 80. Salvada French was executed for this crime. On December 9, at Paris, during a session of the Chamber of Deputies, a bomb was thrown from the gallery. A woman, perceiving the intentions of the thrower, grasped his arm, causing the bomb to strike a chandelier and explode harmlessly. Vaillant, whose real name was Königstein, a man of German descent, was immediately identified as the thrower, and was executed Jan. 10, 1894, his last words being "Vive l'anarchie!" The French government had previously passed a law making such attempts capital offenses, even though no one was killed. A week after the execution of Vaillant, and in revenge for his execution, a man named Emile Henry exploded a bomb in the café of the Hôtel Terminus, severely wounding many guests. Henry was executed May 21, 1894. In March, 1894, a bomb exploded before the Chamber of Deputies at Rome, but did no great harm. On June 16 an attempt was made on the life of Crispi. For this Paul Fega was sentenced to 20 years' imprisonment. President Carnot of France was assassinated June 24 by an Italian anarchist, Santo Caserio. He died the following day. Caserio was guillotined August 15. A plot against the French Premier Dupuy was frustrated. Active measures were taken against the anarchists, particularly in Italy, where some 2000 suspects were arrested during the summer. The year 1895 was comparatively quiet. In 1896, 11 were killed and 40 wounded by an explosion at Barcelona. For this, which was the result of a conspiracy, 5 men were shot, 13 imprisoned for over 10 years, and 7 for less than 10 years. The premier of Spain, Señor Cánovas del Castillo, was assassinated Aug. 8, 1897, by an Italian, Michele Angiolillo, who was executed 11 days after the crime. On Sept. 10, 1898, the Empress of Austria was assassinated in Switzerland by an Italian, Luccheni, who had come thither intending to kill the Duke of York, but, not finding him, vented his fury upon the Empress. Luccheni was immediately apprehended and sentenced to solitary confinement for life. The death of the Empress caused the summoning of an anti-anarchist conference, attended by representatives of the various governments. The sessions were held at Rome, November 24 to December 21. The results were not made public. King Humbert of Italy was assassinated July 29, 1900, by a countryman, Angelo Bresci. Bresci had been living in America and went to Italy intending to assassinate the King. The murderer was sentenced to life imprisonment. On May 31, 1906, the wedding day of Alfonso XIII of Spain and Princess Ena of Battenberg, a bomb was exploded near the royal carriage on its way from the church at Madrid where the marriage was performed. About 20 persons of the royal escort were killed. In 1909 serious riots occurred in Barcelona that were ascribed, though not on

very satisfactory grounds, to the teachings of the anti-clerical Francisco Ferrer (q.v.). Ferrer had been engaged in anarchistic propaganda at an earlier period of his life, but had abandoned anarchism in order to devote himself to scientific education. None the less he was arrested, tried, and executed Oct. 12, 1909. In November, 1910, an attempt was made by a group of anarchist socialists to assassinate the Mikado. Twenty-five of the conspirators were sentenced to death; only 12 of them, however, were executed. On March 18, 1913, King George of Greece was assassinated at Salonica by an anarchist named Aleko Schinas.

United States. America has witnessed but two such outrages. The first was the famous Haymarket explosion at Chicago on May 4, 1886. This occurred at a large assembly of workingmen. The speakers began uttering revolutionary sentiments, and the gathering was ordered to disperse by the police. An unknown person threw a bomb, killing seven policemen and wounding 60. In the mêlée following, some workmen were killed and others wounded. For this seven were condemned to death, and one (Neebe) to 15 years' imprisonment. Ling committed suicide the day before the time set for the execution. Spies, Parsons, Fisher, and Engel were hanged Nov. 11, 1887, the sentences of Schwab and Fielden having been commuted to life imprisonment. Later Governor Altgeld pardoned Neebe, Schwab, and Fielden. The second was the murder of President William McKinley, at Buffalo, N. Y., Sept. 6, 1901, by Leon F. Czolgosz, who was executed by electricity Oct. 29, 1901. As a result of the ensuing agitation against anarchism, a law was enacted by Congress in 1902 excluding anarchists from the classes permitted to immigrate into the United States.

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ANASAR'CA. A form of dropsy in which there is an accumulation of fluid in the loose tissues of the body. See DROPSY; OEDEMA; BRIGHT'S DISEASE.

AÑASCO, ä-nyäs'kö. A town in the west central part of Porto Rico, on the Añasco River, a few miles from its mouth, and 6 miles north of Maguayez (Map: Porto Rico, A 2). It is the centre of a fertile agricultural region which produces sugar, tobacco, coffee, and vegetables of all kinds. The town has six public schools, a church, and a large sugar-grinding plant. Pop., 1899, 2483; 1910, 3064.

ANASTASIA, än'äs-tā'shī-ä (?-597). A Greek saint. Her beauty attracted the Emperor Justinian, and in order to escape his dishonorable attentions she retired to Alexandria, where she lived 28 years, disguised as a monk. The date of her commemoration is March 10.

ANASTASIA, SAINT. A Christian martyr, slain during the reign of Nero (54-68 A.D.). She is said to have been a pupil of St. Peter and St. Paul. The date of her commemoration is April 15.

ANASTASIA THE YOUNG'ER. A noble

Roman woman who suffered martyrdom during the Diocletian persecution (303 A.D.); the wife of Publius, a pagan, who informed against her as a Christian. Two letters written by her in prison are preserved in Suidas. The Greeks commemorate her as a saint on December 22; the Latins, on December 25.

ANASTASIUS, ăn'ăs-tă'shī-us. A romance by Thomas Hope, an English author and virtuoso (q.v.). It describes the adventures of a Greek youth who, after being acquitted by a Turkish magistrate before whom he was brought for an alleged offense, becomes a soldier of the Sultan and fights under the Turkish flag. In Constantinople he engages in different occupations that are either trifling or discreditable; then, after professing the Mohammedan faith, he travels in Sicily, Italy, and eastern countries and dies in obscurity and neglect. In literary circles the author has ever since been known as "Anastasius" Hope.

ANASTASIUS. The name of four popes and one antipope.—**ANASTASIUS I**, Pope from 398 to about 402. He healed an unseemly strife at Rome by ordering the priests as well as the deacons to stand bowed while the Gospel was read in the Church service. He was vehemently opposed to the doctrines of Origen, one of whose works (*Peri Archon*, i.e., 'Concerning Principles') he condemned as heretical. He is praised by Jerome, who calls him a man of a holy life, of a "rich poverty," and of an apostolic earnestness. He died December, 401, or April, 402. His letters and decretals are in Migne, *Patrol. Lat.*, xx.—**ANASTASIUS II**, Pope from 496 to 498. He was born in Rome. He endeavored to heal the breach with the Eastern church, but the attempt was so ill-judged that Dante puts him in Hell. He died in November, 498.—**ANASTASIUS III**, Pope from 911 to 913. He was born in Rome.—**ANASTASIUS IV**, Pope from 1153 to 1154. He healed two important ecclesiastical quarrels by recognizing Wichmann as Archbishop of Magdeburg, and William as Archbishop of York. He died in Rome Dec. 3, 1154. His letters are in Migne, *Patrol. Lat.*, clxxxviii.—The Antipope **ANASTASIUS** was opposed to Benedict III in 855, but speedily degraded.

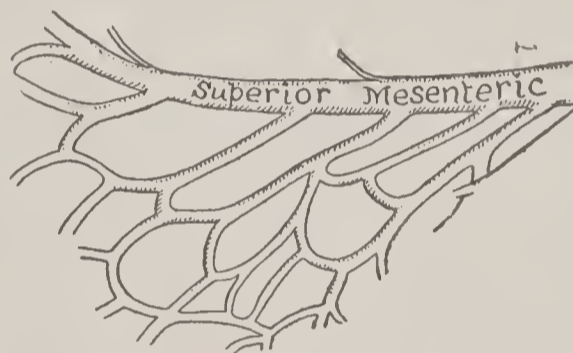
ANASTASIUS I (c.430–518). Emperor of the East. He was proclaimed Emperor at Constantinople on the death of Zeno, in 491. He was a native of Dyrrachium, but had spent most of his life in public office at Constantinople. He was over 60 years old at his accession, and was noted for his ability, integrity, and justice. "Reign as you have lived" was the cry with which he was greeted on his first public appearance. He married the widow of Zeno, but had no children. His reign was troubled by local revolts, by a war with Persia in 502–505, and by invasions of Huns, Slavs, and Bulgarians. To check the last, Anastasius built, in 512, the wall which bears his name, 35 miles west of Constantinople. Yet his reign was a very prosperous one. He was unpopular with some, because he was suspected of being addicted to the Monophysite heresy (q.v.); with others, because he was thought to be too puritanical. He suppressed gladiatorial combats with wild beasts and licentious dances. He erected fortresses on the boundaries, restored ruined cities, suppressed some of the most obnoxious taxes; yet he left the treasury, which he had found empty, filled with 320,000 pounds of gold; and a well-disciplined army of 150,000 men. He preserved the

Empire intact, having governed it wisely, leniently, and justly. See Gibbon, *Decline and Fall*, edited by Bury, vol. iv (London, 1898), and Bury, *Later Roman Empire* (London, 1889).

ANASTASIUS II (died 721). Emperor of the East, elected to the throne of Constantinople by the Senate and people in 713. He organized a formidable naval force, which mutinied at Rhodes and proclaimed Theodosius, a person of low birth, Emperor. Theodosius took Constantinople six months later and deposed Anastasius (716), who escaped to Thessalonica and became a monk. In 721 he headed a revolution against the Emperor Leo and was captured and put to death by the latter.

ANASTASIUS THE LIBRARIAN (BIBLIOTHECARIUS) (?–886). A librarian of the Vatican, and abbot of Santa Maria Trans Tiberim, Rome. He was present in 869 at the eighth Council of Constantinople, whose canons he translated into Latin. He wrote a *Historia Ecclesiastica* (edited by Fabretti, 1649, and the *Liber Pontificalis*, biographies of the popes from St. Peter to Nicolas I.

ANAS'TOMO'SIS (Gk. ἀναστόμωσις, an opening of the mouth, from ἀνά, *ana*, again + στόμα, *stoma*, mouth). An anatomical term used to express the union of vessels which carry blood or other fluids, and also, for convenience' sake, the junction of nerves. The veins and lymphatics



ARTERIES ANASTOMOSING.

anastomose to form large single trunks as they approach their ultimate destinations. The arteries break up into small branches, for the supply of the tissues, and each small vessel again communicates with others given off above and below. At each large joint there is a very free anastomosis, so that the safety of the limb beyond may not be entirely dependent on a single arterial trunk, exposed to all the obstructive influences of the different motions of the limb. After a main artery has been permanently obstructed, the anastomosing vessels enlarge, so as to compensate for the loss; but after a time only those whose course follows that of the parent trunk remain enlarged, and the others gradually regain their ordinary dimensions.

AN'ATASE. See OCTAHEDRITE.

ANATH'EMA (Gk. ἀνάθημα, or ἀνάθημα, *anathēma*, that which is set up, offered, or dedicated, from ἀνά, *ana*, up + τίθειναι, *tithenai*, to put, set, place). A word originally signifying some offering or gift to Deity, generally suspended in the Temple. Thus, we read in Luke xxi. 5 that the Temple was adorned "with goodly stones and gifts" (*anathemasi*). It also signifies a sacrifice to God; and, as the animals devoted to be sacrificed could not be redeemed from death, the word was ultimately used in its strongest sense, implying eternal perdition, as in Rom. ix. 3, Gal. i. 8–9, and other places. In the Catholic church a distinction has been made between excommunication and anathema-

tizing; the latter being the extreme form of denunciation against obstinate offenders. The synod of Elvira (306) anathematized those who placed libelous writings in the Church and those who read them; the Nicene Council (325), the Arians; and so later councils and synods those who seriously offended. Thus, that of Paris (846) forbids anathematization to bishops without the consent of their archbishop and fellow bishops, on account of its being a "condemnation to eternal death."

AN'ATHOTH. A town in Palestine, 2½ miles northeast of Jerusalem, and one of the places assigned to the Levites (Josh. xxi.; 1 Chron. vi. 60). It was the birthplace of Jeremiah (Jer. i. 1), as well as the home of Abiathar, the high priest (1 Kings ii. 26), of Abiezer (2 Sam. xxiii. 27), and of Jehu (1 Chron. xii. 3), all prominent in the days of David. The name appears to be the plural of Anath, the Syrian goddess of war, whose name occurs also in Beth-Anath, Samgar ben Anath, and Anammelech (q.v.). It was an important place, being reoccupied after the exile (Ezra ii. 23; Neh. vii. 27). On its site stands at present the little village of Anata, at the top of a hill commanding a view of the Dead Sea. Building stones for Jerusalem are still supplied from a quarry at Anata. It was at Anathoth that Jeremiah bought a field, as a symbol of the assured return from the Babylonian captivity (Jer. xxxii. 7).

ANAT'IDÆ (Lat. *anas*, duck). The family of ducks, geese, and swans (qq.v.). See ANSERES.

ANATOLI, ä'nä-tō'lē, JACOB BEN ABBA (1194-1256). Hebrew translator of Arabic scientific literature and allegorical commentator. He was born in southern France and was invited by Emperor Frederick II of Hohenstaufen to Naples, where he devoted himself chiefly to the translation of Arabic authors or Arabic versions of Greek writers into Hebrew. He was related by marriage to Samuel ibn Tibbon, the translator of Maimonides, and became a great admirer of the Jewish philosopher. Under his influence he wrote his *Mamad ha-talmidim*, 'Goad to the students,' a collection of exhortatory addresses intended to stimulate study. In this work he shows his familiarity with Plato, Aristotle, Averroes, and Christian scholars. He speaks in the highest terms of Michael Scot. Anatoli translated Averroes, Ptolemy's *Almagest*, Al Fargani's *Elements of Astronomy*, and Al Farabi's *Treatise on the Syllogism*. Consult Steinschneider, *Die Hebräischen Uebersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893).

AN'ATO'LIA (Gk. Ἀνατολή, *Anatolē*, a rising, east, i.e., from Constantinople; from ἀνά, *ana*, up + τέλλειν, *tellein*, to make to arise, to rise). The modern name for Asia Minor; Turkish, *Anadoli*. It embraces the western peninsula of Asia, bounded by the Armenian highlands on the east, Syria and the Mediterranean on the south, the Ægean Sea on the west, and the Black Sea and the Sea of Marmora on the north. Its area is 193,590 square miles (Map: Turkey in Asia, D 3). It constitutes the western prolongation of the high table-land of Armenia, with its border mountain ranges. The interior consists of a great plateau, or rather series of plateaus, having an average elevation of about 3000 feet, with bare steppes, salt plains, marshes, and lakes; the structure is volcanic, and there are several conical mountains, one of which, the

Argish (or Ergish) Dagh (Argæus), with two craters, rises about 10,000 feet above the plain of Kaisariéh, which has itself an elevation of between 2000 and 3000 feet. The plateau is bordered on the north by a long train of parallel mountains, which skirt the coast of the Black Sea and extend all the way to the Mediterranean and which are cut up into groups by cross valleys. These ranges vary greatly in height, the greatest elevation in the extreme east being about 12,000 feet. They sink abruptly down on the north side to a narrow strip of coast; their slopes toward the interior are gentler and bare of wood. Similar is the character of the border ranges on the south, the ancient Taurus, only that they are more uniform and on the average much higher, although their loftiest summits do not rise above the highest peak of the northern mountains. The Taurus and Anti-Taurus are crossed by several good passes, the most important and famous being the Gölek-Boghaz, or 'Cilician Gates,' 30 miles north of Tarsus, the pathway of all armies, traders, or travelers for ages, the route to and from the Euphrates valley. The western border is intersected by numerous valleys, opening upon the Archipelago, through the highlands of the ancient Caria, Lydia, and Mysia, to the northern part of which mounts Ida and Olympus belong. Between the highlands and the sea lie the fertile coast lands of the Levant. The western coast of Anatolia is remarkably indented and fringed with the islands of the Archipelago. The rivers of Anatolia are not navigable; the largest are the Yeshil-Irmak (Iris), the Kizil-Irmak (Halys), and the Sakariah (Sangarius), flowing into the Black Sea; and the famous Ghediz-Tchai (Hermus), and Menderes (Mæander), into the Ægean. The largest of the salt lakes are Tuz-Tchöllü, Bei-Shehr, and Egerdir.

The climate bears, on the whole, a south European character; but a distinction must be made of four regions. The central plateau, nearly destitute of wood and water, has a hot climate in summer and a cold one in winter; the southern coast has mild winters and scorching summers; while on the coast of the Ægean there is the mildest of climates and a magnificent vegetation. On the northern side the climate is not so mild as on the western; yet the vegetation is most luxuriant, and a more delightful or richer tract than the coast from the Sea of Marmora to Trebizond is hardly to be found. The whole peninsula is subject to earthquakes.

In its flora and fauna Anatolia forms the transition from the continental character of the East to the maritime character of the West. The forest trees and cultivated plants of Europe are seen mingled with the forms peculiar to the East. The central plateau, which is barren, except when assisted by irrigation, has the character of an Asiatic steppe, more adapted for the flocks and herds of nomadic tribes than for agriculture; the southern and western coasts, on the contrary, are characterized by a luxuriant vegetation, which includes the southern fruits of Europe with a slight admixture of the tropical plants of Africa.

Mining is little developed in Anatolia, although its mineral wealth is large and varied, including deposits of coal, lead, manganese, copper, iron, gold, salt, petroleum, meerschau, and many others. The agricultural products include the common grains, fruits in

great variety and abundance, tobacco, cotton, and poppy-seed. Much silk is produced. Among the exports are prunes, figs, olives, poultry, eggs, skins, cattle, carpets, silk, gums, wax, drugs, nuts, sponges, and minerals. Transportation facilities are still inadequate; the railways had in 1910 a total length of 1474 miles.

The population of Anatolia, according to recent estimates, is over 9,089,200, composed of a number of different races. Turks are found all over the country, and occupy the foremost position, both in commercial and in political life. The Turkomans, who are akin to the Turks, are mostly nomadic. Greeks and Armenians constitute a considerable fraction of the population, and commerce is to a great extent in their hands. Other elements are Kurds, Yuruks, Lazes, Jews, and Circassians. About four-fifths of the inhabitants are agriculturists or herdsmen. Among the cities are Smyrna, Scutari, Brusa, Kaisarieh, Adana, Konieh, Sivas, Manissa (Magnesia) Aidin, Trebizond, Amasia, Tokat, Angora, Adalia, Ismid, and Kutaia.

This region was an early seat of civilization. The country has passed under the supremacy of one race after another, and it has been the scene of numerous wars, both in ancient and in modern times. The west coast was early lined with opulent Greek cities, the seats of poetry, learning, and the arts, and great centres of colonization. In the first half of the sixth century B.C. the kingdom of Lydia, under Cræsus, attained the height of its splendor. Cræsus was conquered by the Persians who extended their sway over the whole peninsula. The rule of Macedon succeeded that of Persia. After the disruption of Alexander's Empire the Seleucid kings of Syria were dominant. By the side of the Seleucid realm various states arose, Pergamon, Bithynia, Cappadocia, and Pontus. The Romans first carried their arms into Asia Minor at the beginning of the second century B.C., when they vanquished Antiochus the Great of Syria. In the following century Pontus was a mighty realm under Mithridates the Great, who succumbed to the arms of Pompey. After 395 A.D. Asia Minor formed part of the Greek, or Byzantine, Empire. Under the Byzantines it received the name of Anatolia. In the eleventh century the Seljuks made themselves masters of the region, where they established the sultanate of Rum, with its capital first at Nicæa and then at Iconium. The close of the thirteenth century witnessed the beginnings of the power of the Ottoman Turks, who in the course of the following century established their sway over Asia Minor, which now became a great base whence Mohammedan conquests were carried on in Europe. Since 1453 the Ottoman Turks have ruled Anatolia from Constantinople. The ancient divisions of this region were Pontus, Paphlagonia, Bithynia, Galatia, Lycaonia, Phrygia, Cilicia, Caria, Pisidia, Pamphylia, Cappadocia, Mysia, and Lydia.

Consult: Percy, *The Highlands of Asiatic Turkey* (London, 1901); Oberhummer and Zimmerer, *Durch Syrien und Kleinasien* (Leipzig, 1898); K. Kaunenberg, *Kleinasien's Natur-schätze* (Berlin, 1897); J. Bryce, *Trans-Caucasia and Ararat* (London, 1896); H. C. Barkley, *A Ride through Asia Minor and Armenia* (London, 1891).

ANATOMY. The science that treats of the structure of organic forms, so called from dissection (Gk. *ἀνά*, *ana*, apart + *τέμνειν*, *temnein*, to cut), formerly the sole method of investiga-

tion. It is distinguished as Human, Animal, or Plant Anatomy, according to the organisms under consideration; as Normal or Pathological Anatomy according as these are in health or diseased; as Macroscopic or Gross Anatomy when it deals with structure visible to the naked eye; and as Microscopic or Minute Anatomy when the microscope is used as a means of research. This last division is known as Histology, in view of the delicate webs of structure or tissues (*ιστός*, *histos*, web) it investigates. Comparative Anatomy (see ANATOMY, COMPARATIVE) involves a comparison of the different forms of animals and plants, and Developmental Anatomy or Embryology an account of the different forms assumed by a single individual during its growth.

Other designations applied to anatomy have reference to its application. Dissection and the preparation of anatomical specimens is often called Practical Anatomy; the arrangement of the facts of structure according to their bearing upon the diagnosis and treatment of disorders is Applied Anatomy, which may be divided into Surgical Anatomy, that dealing with structure accessible for surgical operations, and Medical Anatomy, that relating to structure which can be reached only indirectly. The consideration of the deeper relations and causes of structure is called Philosophical Anatomy, or Morphology, and a purely speculative or theoretical disquisition of this kind is termed Transcendental Anatomy.

Anatomy may be treated in two different ways—as Descriptive or Systematic Anatomy, that arranges the facts of the science with reference to the structural affinities of organs forming the systems of the body, or as Topographical or Regional Anatomy, that considers the organs merely with reference to their exact situation and relations to each other. Descriptive Anatomy is usually subdivided into Osteology (see BONE and SKELETON), that treats of the osseous system; Syndesmology, that treats of the ligaments; or Arthrology, that considers the ligaments and joints; Myology, that treats of the muscles; Neurology, of the nerves; Angeiology, of the vessels; Splanchnology, of the viscera.

HISTORY

The knowledge of anatomy possessed by the ancients was slight. The importance of exact information not being generally recognized, and the dead body being held especially sacred, examination of the cadaver was rare and attended with great difficulties. It is among the Greeks that the first traces of the science are found. Hippocrates (460–360 B.C.) and his school appear to have had some knowledge of the skeleton and of the larger viscera; Aristotle (384–323 B.C.) examined a large number of animals and had some remarkably just ideas as to their genetic relationships; Herophilus (c.300 B.C.) and Erasistratus of Alexandria investigated the vessels and the glandular organs. At the Alexandrian school dissection was first publicly practiced, and there a considerable advance was made in the knowledge of the human body. Only fragments of the writings of this time have come down to us. Herophilus described the sinuses of the dura mater, the retina, the lacteals, and the lymphatics, and admitted that the arteries contained blood, his predecessors having held that, like the air-tubes of the lungs, they normally carried air during life. Erasistratus con-

sidered the brain as an organ for the transformation of the "vital spirits" received from the air into "animal spirits" and distinguished between nerves of motion and those of sensation.

The prejudice against dissection appears to have finally overcome the progress achieved by the Alexandrian school, and the belief became current that the healing art depended upon metaphysical conditions impossible to elucidate by an examination of structure. The next considerable advance was made by Claudius Galen (q.v.) of Pergamus (131-201 A.D.), who compiled much from Celsus and others, and was the author of the first systematic treatise that has come down to us. He appears to have examined apes rather than man, but correctly described most of the bones, joints, muscles, cranial and spinal nerves, and many features about the brain and its membranes. He performed a great service for anatomy by clearly and exactly describing what he had actually inspected and by recording his observations in a methodical manner. These very merits, however, caused the almost universal acceptance of his erroneous physiological speculations, which gave rise to false ideas of the structure of the circulatory apparatus that prevailed until the middle of the seventeenth century. He taught that after digestion food is carried to the liver by the portal vein, and there converted into crude blood having nutritive properties due to "natural spirits"; that from the liver it passes to the right side of the heart, where a portion enters the venous system, in which it ebbs and flows, affording nutrition to the body, another portion passing through invisible pores in the septum of the heart to its left side, where it becomes mixed with air drawn in from the lungs by the pulmonary veins, and thus receives the "vital spirits," and is freed from impurities (fuliginous vapors) by the "innate heat" of the heart; thus vitalized and clarified, it passes into the arterial system, in which it also has an oscillatory motion, endowing the body with the higher functions of life, while in the brain it is further elaborated to "animal spirits" that are conveyed throughout the body by the tubular nerves to impart movement.

The irruption of the northern barbarians arrested all attempts at scientific research, and it was not until after the renaissance of letters and science at the hands of the Arabs, who resuscitated the learning of the ancient Greeks, that further advances were made. At Salerno and Montpellier active medical schools were established, and some attempt was made to revive the study of anatomy. Frederick II, Emperor of Germany (1215-50), is said to have forbidden any one to practice surgery without a competent knowledge of anatomy, and to have provided that every five years there should be held at Salerno a public dissection, to which physicians and surgeons from all parts of the Empire were invited. At Montpellier the cadavers of criminals were regularly dissected. The Senate of Venice decreed in 1308 that a human body should be dissected annually. Doubtless autopsies were occasionally held to determine deaths by poisoning, which were not infrequent at this period. At the University of Bologna Mundinus dissected several bodies publicly and published, in 1315, an imperfect little handbook based upon Galen and Arabian authors. At Prague dissection was practiced from the very foundation of the university (1348), at Vienna as early as 1404, at

Tübingen from 1482, and at London from 1540. At Padua (1490) Benedetti erected an anatomical amphitheatre and made public demonstrations. Somewhat later Berengarius of Carpi is said to have dissected more than 100 cadavers. Vidius, from whom the Vidian nerve and Vidian canal are named, professor at Pisa, Guintherius of Andernaeh (1487-1574), professor at Louvain, and Jacobus Sylvius (1478-1555), professor at Paris, as well as many others, dissected from time to time. There was, however, nothing like a careful and systematic examination of the structure of the body. It was considered sufficient to open the great cavities and display the viscera, which were examined in the most superficial manner. Great reliance was placed upon Galen and Hippocrates, supplemented by their Arabian commentators, and their authority was rarely questioned.

Andreas Vesalius (1514-64) (q.v.) of Brussels was the first to proclaim openly the new doctrine, that the structure of man should be learned by a thorough inspection of the human body rather than by reference to ancient authorities. He dissected frequently in public at Padua, Pisa, and Verona, and published, in 1543, his great work, *De Humani Corporis Fabrica*, the first careful and complete description of the body of man based upon actual observation. This work was illustrated by excellent plates made by Stephen von Calcar, a pupil of Titian. Many of Galen's errors were corrected, and the student was urged again and again to verify each statement by reference to the only prime authority, the body of man itself.

A storm of opposition was at once raised. Sylvius, a pronounced Galenist, declared Vesalius to be an impious madman, whose breath poisoned Europe, and he strove in every way to discredit his work. Others, more rational in their opposition, pointed out errors in Vesalius's own book. The ardent young Fleming, impatient and chagrined at this, resigned his chair at Padua and retired to the court of Philip II, at Madrid, where he tried to continue his studies. His enemies did not scruple to attempt to rouse the Inquisition against him. Philip interrogated the faculty of the University of Salamanca, then the leading theological school in Europe, as to whether dissection was permissible. After due deliberation a reply was given, that, since a knowledge of anatomy is useful to man, dissection may be allowed (1556).

The atmosphere of the Spanish court was far from congenial to scientific pursuits. Vesalius contemplated a return to Italy; but coming back from Palestine, whither he had gone, as is supposed, in fulfillment of some vow, he was shipwrecked, and died on the island of Zante. He was the founder of modern anatomy in the sense that he broke with tradition and substituted actual investigation for reliance on authority.

The contemporaries and successors of Vesalius aided much in placing Gross Anatomy upon secure and lasting foundations. The most illustrious among these were Eustachio (c.1520-74) (q.v.), Fallopio (c.1523-62) (q.v.), and Fabricius (1537-1619).

Eustachio made many corrections of the work of Vesalius and was besides an original investigator of great force. From plates prepared by him (but not published until the eighteenth century), it appears that he anticipated many discoveries ordinarily ascribed to anatomists of a later period; but the Eustachian tube, which he

accurately described, is said to have been previously discovered by Alcmaeon about 500 B.C.

Fallopio named the Fallopian tubes (previously discovered by Herophilus) and the seminal ducts and gave a good description of the organ of hearing, discovering in the temporal bone the aqueduct and hiatus that commonly bear his name.

Fabricius of Aquapendente erected at Padua an anatomical amphitheatre. He studied the development of the fœtus and of the embryo chick, described the muscular coat of the alimentary canal and of the bladder, and especially the valves of the veins first discovered by Stephanus of Paris in 1545 and in some situations figured by Vesalius in the second edition of his work. Fabricius supposed that they were for the purpose of retarding the oscillatory flow of the venous blood.

It fell to a pupil of Fabricius, William Harvey, to explain them more satisfactorily and to free anatomy from some of the false notions that survived from the Galenical teaching. From about 1615 to 1628 Harvey demonstrated by public lectures and by published experiments the true circulation of the blood. The lesser or pulmonary circulation had been mentioned by Servetus in 1553 in an obscure pamphlet, and by Realdus Columbus in 1559, but was not generally accepted. Cæsalpinus, in some controversial works published in 1571 and 1593, suggested the probability of a systemic as well as a pulmonary circulation and was the first to use the term *circulatio* in this connection. Yet the Galenical theory of the oscillatory movement of the two kinds of blood and the necessary supposition of orifices in the septum between the cavities of the heart were still taught. Vesalius, it is true, had said that he could not find the orifices and somewhat satirically wondered at the wisdom of the Almighty, who had made them so small that they could not be seen. Harvey, to use his own words, "taught anatomy, not from books, but from dissections; not from the suppositions of philosophers, but from the fabric of Nature," and in a series of most carefully conducted investigations and vivisections succeeded in showing that the blood makes a complete circuit of the body as well as of the lungs. Harvey's work led to a more careful examination of the heart and blood vessels. Stephen Blankaard, in 1675, first effectively demonstrated the finer vessels by injection, a method used by Frederick Ruysch (1638-1731) to show their presence in great numbers in almost every part of the body. The lymphatics, casually seen by several ancient observers, were first carefully studied by Caspare Aselli in 1622. The thoracic duct, discovered first by Eustachius in the horse, was seen in the dog by Pecquet (1627-74) and traced through the diaphragm to the *receptaculum chyli*. It was first observed in man by Jan van Horne (1621-70), professor at Leyden. Still under the hallucination caused by the Galenical theories, anatomists thought that both lacteals and thoracic duct could be traced to the liver. Rudbeck discovered the general lymphatic system in 1651.

A clearer idea of the gross anatomy of the brain, especially of its internal cavities, was due to the descriptions of Francis Boë (Du Bois), usually known as Franciscus Sylvius (1614-72), professor at Leyden, whose name survives in the aqueduct, fissure, fossa, and artery of Sylvius. The science of chemistry was at this

time gradually emerging from the superstitions of alchemy, and Sylvius is also famous for being among the first to attempt to differentiate the structures and fluids of the body by means of their chemical reactions. Vieussens (1641-c.1720) of Montpellier also increased the knowledge of the nervous system, both central and peripheral, describing the anterior pyramids, the olive, and the anterior medullary velum which sometimes bears his name. To Thomas Willis (1621-75) (q.v.) of London, sometime professor at Oxford, is due a systematic description of the brain and its cavities, together with a classification of the cranial nerves in which he finally separated the sympathetic cord from that series. He recognized that the brain becomes gradually more complicated as we ascend the animal scale and that it is more easily understood by a study of the lower and more simple forms. The decussation of the pyramids was first described by Duverney (1648-1730), demonstrator at the Jardin du Roi, afterward the Jardin des Plantes, at Paris. The doctrine of the "animal spirits," supposed to fill the ventricles of the brain and to be distributed by the nerves, was first seriously attacked by Wepffer (1658).

The advance of the physical sciences instituted by Galileo (1564-1642) had a profound effect upon anatomy. The new developments in optics were now called on to contribute to the problems of structure. The optical properties of the crystalline lens were now described by Kepler (1571-1630) (q.v.), the eminent astronomer, who denied that it is the seat of vision as supposed by Hippocrates; the image on the retina was demonstrated by Scheiner (1575-1650); Descartes (1596-1650) showed the eye to be a camera obscura and suggested that accommodation is produced by a change in the convexity of the lens. He also made some very acute observations on the structure and functions of the nervous system, marred, however, by metaphysical speculations that were attacked by Stensen, who declared that in order to determine the functions of organs we must first ascertain their structure.

A new instrument of research which the Italians, impelled by the zeal imparted by Galileo, were the first to apply to scientific uses, was now introduced. This was the microscope, hitherto merely an optical curiosity. The magnifying power of convex lenses was known to the ancients, for even in the ruins of Nineveh a polished rock crystal lens has been found, and there is good reason to believe that similar instruments were used in ancient Egypt and in Greece. Spectacles were used in Europe as early as the thirteenth century, and the compound microscope was invented about 1590 by Hans and Zacharias Janssen of Middleburg, Holland. No means for correcting chromatic and spherical aberration being then known, the first instruments were clumsy and imperfect; consequently, many investigators preferred to use the simple microscope, especially after Leeuwenhoek had shown what excellent results could be obtained with small but accurate lenses.

Among the first and most acute observers was Marcello Malpighi (1628-94), professor at Bologna, Pisa, and Messina, a man of extraordinary acuteness of intellect, combined with an indomitable zeal for natural research. He left his mark in almost all departments of biology. He was an accomplished botanist, and by his researches among plants laid the foundations of

the modern cell-theory; he was an entomologist, devoting himself to an exhaustive study of the anatomy and development of the silkworm; he was an embryologist, being the first to build upon the incomplete studies of Harvey and Fabricius and describe adequately the changes of the chick in the egg; he was a pathologist, studying carefully post-mortem appearances and the causes of disease; he was also a comparative anatomist, drawing many of his conclusions as to the structure of man from an examination of animals.

Before Malpighi's time but little was known regarding the structure of glands. Under this designation were included many non-glandular organs, like the tongue and the brain, the latter being supposed to secrete not only the animal spirits but the nasal mucus, or *pituita*, which was believed to pass down through holes in the cribriform plate of the ethmoid bone. Sylvius had, it is true, distinguished as conglomerate glands aggregations like the pancreas and the salivary glands, and as conglobate glands those of the lymphatic ducts. The ducts of some of the larger glands were unknown, the liver was considered a great blood-making organ that received the bile elaborated by the gall-bladder for the purpose of combining it with the blood, and the mechanism of secretion was wholly misunderstood. Wirsung discovered the pancreatic duct in 1642, but supposed it to be a lymphatic vessel leading to the liver; Wharton described the submaxillary duct in 1652; Steno, the parotid duct (previously thought to be a tendon) in 1661; Bartholin, the sublingual duct; Bellini, the straight tubules of the kidney in 1662; Peyer, the closed follicles of the intestines in 1677, and Brunner, the duodenal glands in 1682. Schneider (1614-80), professor at Wittenberg, finally described the pituitary membrane of the nasal passages and settled the origin of the nasal mucus. It was Malpighi, however, who first united these scattered observations and gave a clear idea of the structure of acinous glands. It was during his researches on this subject that he discovered the acinous structure of the lung and demonstrated that there are no visible orifices by which air can pass from the vesicles into the pulmonary veins. Here, too, he first observed, in the lung of the frog, the capillary blood vessels "distributed in a ring-like fashion," thus justifying Harvey and forever settling the question of the circulation of the blood. He described most of the structure of the kidney as it is known to us to-day, and in the spleen discovered the bodies that bear his name. He saw and described the red blood corpuscles, unaware that they had been previously discovered by Swammerdam, a Dutch anatomist, in 1658. Extending his researches to the skin, he discovered the rete mucosum, or Malpighian layer, and the papillæ, which he surmised were organs of touch. He elucidated the structure of the liver, which Glisson (1597-1677), professor at Cambridge, had already carefully described, showing that it is an acinous gland of peculiar construction, and, by tying the bile duct, demonstrated that the bile is formed in the liver and not in the gall-bladder.

As a consequence of the increase of the power of vision by the use of the microscope, the phenomena of fecundation and the development of the embryo began to receive attention. Spermatozoa were discovered in 1677 by a pupil of Leeuwenhoek, and De Graaf, discovering the

ovisacs (Graafian follicles) about 1672, supposed them at first to be ova. Naboth, too, discovering the closed follicles of the neck of the uterus, supposed them to be ova (*Ovula nabothi*). The ova of the lower vertebrates were, of course, well known, and the phenomena of their development were specially investigated by Malpighi. Van Horne, of Leyden, probably saw the human ovum in 1668, but it was not unmistakably recognized until Von Bär demonstrated it in 1827.

During the course of this investigation two schools arose—the Animalculists and the Ovists, who respectively maintained the superior efficacy of the male or female elements. Attempts were made to explain the transmission of hereditary qualities from parent to child. Aristotle, having studied the development of the egg, had declared that the embryo primitively consisted of simple, undifferentiated material, from which, by successive stages, the adult was formed (theory of post-formation or epigenesis). Opposed to this was another contention, that either the male or the female elements must possess in miniature all the organs of the adult (theory of preformation).

A further result of microscopic research was an enlarged view as to the distribution of living things. The discovery by Leeuwenhoek (1632-1723) that organic infusions soon become replete with living forms when exposed to the air, led to the revival of the ancient notion of the spontaneous generation of living from non-living matter. This led to fanciful theories regarding fecundation that were not overthrown until Spallanzani (1729-99) showed that living forms do not develop in infusions that have been boiled and then excluded from the air, and that filtered seminal fluid lost the power of impregnation. Following up the researches of Hartsoeker (1656-1725), he also demonstrated that ordinary air teems with living particles that enter the human body and pass into infusions. This doctrine was termed panspermatism, and developed afterward into the modern "germ theory," which has had a profound influence upon pathological anatomy.

The following discoveries of this period may be briefly noted: Ole Worm (1588-1654), professor at Copenhagen, discovered the intercalary (Wormian) bones of the skull; Clopton Havers, of England, in 1692, the Haversian canals and the intimate structure of bone; Hooke (1635-1703), the primitive fibrillæ of muscle; Kerkring (1640-93), the valvulæ conniventes of the small intestine; Winslow (1669-1760), of Paris, the foramen connecting the two cavities of the peritoneum; Douglas (1675-1742), of London, the recto-uterine pouch and several other features of the peritoneum and the abdominal wall.

The classification of animals by their anatomical structure, attempted first by Aristotle, was revived by several authors during the eighteenth century, and notably by Karl von Linné (Linnæus) of Råshult, in Sweden (1707-78), who considered that each particular species was immutably established at the creation, man being placed at the head in the order Primates. Buffon (1707-88), however, supposed that variations occur from changes of environment, and even hinted that all species may have originated from a primitive common stock. This was afterward more boldly advocated by Lamarek (1744-1829), who was the first to maintain systematically the mutability of species, and to look

upon man as derived from a common stock with other organisms, conceiving that the ancestral record of all might be represented as a branching tree. To this was opposed the authority of the great comparative anatomist Cuvier (1769-1832), who caused these views to sink into obscurity for a time.

The controversy concerning the early development of the human body was renewed during this period. The weight of authority was overwhelmingly in favor of the theory of preformation, notwithstanding the absurdities to which it committed its advocates. Its most earnest supporter was Haller (1708-77) (q.v.), professor at Göttingen, a man of remarkable learning and indefatigable research, who did much to further exactitude in anatomical knowledge and was the leading physiologist of his time. He made many anatomical discoveries in all parts of the body and finally overthrew the doctrine of "animal spirits," which had ruled all investigations of the nervous system since the days of Hippocrates. He declared, however, that the body of our primitive mother Eve must have contained in miniature all individuals of the human race that had existed since her time and that were hereafter to exist! This was the less excusable, as Kaspar Friedrich Wolff, a young medical student, had published in 1759, as his graduation thesis, a remarkable essay, the *Theoria Generationis*, in which he showed by accurate and conclusive observations that the organs of the body are developed from membranous sheets (the blastodermic membranes) and not from preformed rudiments. He even anticipated the cell theory of the next century by stating that these membranes are themselves composed of globules (cells). Wolff made many other important investigations, and his name has been perpetuated in that of the Wolfian body or primordial kidney. Such was the opposition with which his views were received that he was unable to obtain a professorship in Germany and went to Russia. It was not until Meckel called attention to his work in 1812 that his merits were fully recognized.

Aristotle, Eustachio, and Fallopio had surmised that the organs of the body might be composed of simpler elements; Boerhaave (1668-1738) supposed that everything could be reduced to vessels and fibres; Haller (1708-77) classified structures according to their properties; Bonn (1738-1818) considered that membranes are the anatomical basis of structure. It remained, however, for Bichat (1771-1802) to establish clearly the doctrine that the body with all its organs is made up of a small number of simple tissues. This he did by an examination of their chemical, physical, and vital properties, dispensing wholly with the use of the microscope, then a very imperfect instrument. He applied these views to the elucidation of the anatomy of organs affected by disease, a subject previously studied by Morgagni (1682-1771) and by John Hunter (1728-93). Bichat's death, at the early age of 31, caused by imprudent exposure in the dissecting room, was a great loss to anatomical science.

The science of chemistry had now advanced to a point where it could throw much light upon the composition of the animal body. Four great organic gases had been discovered: carbon dioxide (imperfectly known to Van Helmont in 1640) by Black in 1757, hydrogen by Cavendish in 1766, nitrogen by Rutherford in 1772, oxygen

by Priestley in 1774. Lavoisier (1743-94) showed the importance of all these gases to the animal economy. Fourcroy (1755-1809) was practically the first to investigate the composition of organic products.

The investigation of the human body by so many competent and careful observers gave a new scope to anatomical teaching. It was seen that no proper knowledge of anatomy or surgery could be obtained without the use of the cadaver. At first legal enactments and social ostracism were directed against those who practiced dissection; but on the continent of Europe public dissections were frequently held from the time of Vesalius, and as men of commanding intellect like Malpighi, Stensen, Boerhaave, Morgagni, Haller, Bichat, Hunter, and many others devoted themselves to the pursuit of anatomy, the social stigma was gradually removed. On the Continent laws were early enacted by which the bodies of prisoners and paupers were turned over for anatomical purposes. In Great Britain, however, this was not done, and bodies were quite commonly obtained by robbing graves. When, in 1827, the University of Edinburgh made dissection compulsory, and this example was followed by the other large schools in the United Kingdom, the demand for cadavers became so great that it was practically impossible to supply it without breaking the law. A set of ruffians known as "resurrectionists" became established in every large city, and no cemetery was safe from their depredations. In Edinburgh two scoundrels named Burke and Hare made a business of enticing poor and friendless persons into their haunts, smothering them, and selling their bodies to the medical schools for dissection. Similar cases were those of Bishop and Williams in London. A remedy for this was found in an anatomy act passed in 1832, which legalized dissection and authorized the use of available material under certain restrictions.

Improvements in the microscope made about 1824 gave a new impetus to research. Earlier observers (Hooke, 1665; Grew and Malpighi, 1671; Wolff, 1759) had dimly surmised that organic forms were composed of elementary units, but Schwann, in 1839, was the first to demonstrate this for animals in a satisfactory manner. Observations by Von Mohl, Purkinje, Leydig, Kölliker, Virchow, and Max Schultze soon placed this fact beyond cavil, and thus was established the celebrated cell theory, which declared all organized beings to be composed of essentially similar minute units. This led to great improvements in microscopical technique and the investigation of the chemical properties of cells. Stilling invented section cutting in 1842; Gerlach, carmine staining in 1858; Recklinghausen, silver staining in 1860; Waldeyer, double staining with aniline dyes in 1863, and Golgi, bichromate of silver staining in 1873.

With the establishment of the cell theory came some remarkable generalizations, which have had a profound effect upon anatomy. According to the views advanced by Herbert Spencer, Milne-Edwards, and others, the human body is to be considered as a cell community, in which the laws of division of labor and of differentiation that in human society cause specialization into trades, classes, and employments are applied to the morphological units, the cells. Certain cells become specialized for special functions, and thus are produced the diversified forms of the tissues of the body.

Another remarkable result of the improved methods of investigation was that the body of animals was shown to be developed from a single cell, the ovum. The series of phases by which this astonishing change is effected occupied the attention of many investigators, notably Pander; Von Bär, who established the theory of the germinal layers or blastodermic membranes; Serres, who pointed out the great similarity between the successive phases of the embryo and the series of animal forms now existent on the globe, and a great number of others in all civilized nations. Many details of this wonderful series of changes have yet to be supplied, but the general features of it are now firmly established.

A great impulse was also given to Pathological Anatomy. The phenomena of disease were now traced to the cells, and a knowledge of their anatomical changes was found to be essential. In 1836 Cagniard de la Tour discovered the yeast plant, and many fanciful theories of fermentation and disease were overthrown. Pasteur (1822-95) demonstrated that all fermentations and putrefactions are caused by minute spores that swarm in ordinary air. The parasitic character of many disorders now became evident, and the foundation was laid for modern aseptic surgery. See HISTOLOGY; PATHOLOGY.

It was not until 1859 that the knowledge hitherto obtained was fully applied to the elucidation of the causes of bodily structure. In that year Charles Darwin published the *Origin of Species*, and followed it in 1871 with *The Descent of Man*. These works advanced beyond the position of Lamarck, in that they showed an efficient cause for the cumulative variation of structure among organisms. This is the "struggle for existence" which results in the extinction of those forms not suited to the environment. Unlike the speculations of many previous writers, these views were advanced with extreme caution and supported by a great number of careful observations. They were accepted by a large body of naturalists and caused a renewal of activity in anatomy and the allied sciences. It became evident that fully to understand the structure of man it was necessary to ascertain the laws of development both in the embryo and in the animals from which the human stock may be derived. Comparative Anatomy, Embryology, and Palæontology thus became powerful coadjutors to Human Anatomy.

The importance of the study of the varieties of man now became recognized. Previous workers in this field were Camper (1722-89), the inventor of the facial angle; Blumenbach (1752-1840), who divided mankind into five races; and Retzius (1796-1860), the inventor of the cephalic index for comparing crania. In America Samuel G. Morton became widely known by his great collection of crania, now in the Academy of Natural Sciences in Philadelphia. His *Crania Americana* and *Crania Ægyptiaca* were important contributions. His collections were, in 1856, described and commented on by another anatomist, J. Aitken Meigs, who did much to establish the modern methods of the mensuration of the skull. Jeffries Wyman, of Harvard University, was a man of great erudition and philosophical insight and as a morphologist had no superior among the anatomists of his day. He was the first to describe the arrangement of the bony spiculæ in the neck of the human femur and to contrast it with that in those animals that do not assume the erect posture. He gave the first scientific de-

scription of the anatomy of the gorilla, and wrote on symmetry and homology in the limbs, on the vertebral theory of the skull, on teratological subjects, on spontaneous generation, and on the anatomy of the Hottentot. The question of the unity or diversity of origin of the human race, which was closely connected with the origin of species, excited considerable attention in America about the middle of the nineteenth century. J. C. Nott and George R. Gliddon were the joint authors of two important works on this subject, entitled *Types of Mankind* and *Indigenous Races of the Earth*. This study was greatly stimulated by the discovery of human remains in strata belonging to previous geologic epochs, particularly at Engis and Spy in Belgium, Neanderthal near Düsseldorf, at many places in France, and in South America. Finally, the prediction of Morton, made 40 years before, was verified by Dubois, who found, in the Eocene strata of Java, fossil remains of a remarkable transition form between apes and man (1890-95). This department of anatomy was greatly advanced by the zeal and energy of Paul Broca (1824-80) of Paris, who systematized the methods in vogue and invented many new ones for the examination of the human body.

The localization of all active properties in the cells gave renewed impetus to the study of the structure of these "elementary organisms." At first this structure was believed to be comparatively simple, the protoplasm of which the living substance is composed being apparently a structureless jelly having peculiar physical and chemical properties. Further advances toward perfecting the microscope and microscopic technique have shown this to be a mistake. That protoplasm has definite structure is now agreed by all; the details of the structure are still in dispute. Eminent in this investigation were Carl Heitzmann (1830-96) of New York, Flemming of Kiel, and Bütschli of Heidelberg. The phenomena of indirect cell division (*karyokinesis*) were first connectedly observed by Schneider in 1873 and have been especially investigated by Van Beneden, Boveri, Fol, Oscar Hertwig, and Rabl. The ultimate constitution of the cell received a great deal of attention. Nägeli, in 1884, framed an hypothesis that protoplasm is composed of certain elementary units, termed *micellæ*, whose combination produces its physical and vital properties much as a combination of molecules produces the physical properties of inorganic bodies. Similar, more widely developed theories were framed by De Vries, Hertwig, Weismann, and others. Weismann attempts to explain the phenomena of heredity by supposing that bodily characters are caused by architectural peculiarities inherent in the original generative cells. This is, therefore, a reappearance of the theory of preformation so prevalent during the eighteenth century. Experiments by Hertwig appear to have disproved Weismann's views. Great activity in the investigation of the structure of cells still continues. In America Wilson of New York and Whitman of Chicago have made important contributions to our knowledge of this subject. Heitzmann of New York is well known for his attack upon the cell theory as commonly taught, holding that the cells of the body are connected by minute threads of protoplasm; a theory that has recently been confirmed to a limited degree.

The great strides made in our general knowledge of structure during the nineteenth century

can only be briefly mentioned. The structure and development of bone were elucidated by Goodsir, Purkinje, Sharpey, and Kölliker, the osteoblasts being discovered by Gegenbaur in 1864. The mechanism and development of joints were studied by Braune of Leipzig, Sutton of London, Dwight of Boston, and Bernays of St. Louis. The minute anatomy of muscle is still under consideration, and has been investigated by Krause, Ranvier, Cohnheim, and many others; Humphrey and Huxley (q.v.) in England and Gegenbaur in Germany have written on the general morphology of the muscular system, and Gruber, Theile, Testut, and Ledouble have investigated muscular anomalies. The structure of the capillary blood vessels was first correctly demonstrated by Treviranus in 1836. The blood platelets, or hematoblasts, were discovered by Max Schultze in 1865. In 1884 Metchnikoff, then professor at Odessa, laid the foundation of our modern conceptions of the defensive functions of the blood by demonstrating that the white blood corpuscles and cells of lymph glands have the property of destroying bacteria introduced into the tissues (phagocytosis). The lymphatics were investigated by Kölliker, Ranvier, and Sappey.

In the nervous system the discoveries have been many and brilliant, completely revolutionizing previous notions of its structure. Gratiolet first showed the convolutionary pattern of the brain; Broca was the first to prove that certain motor faculties may be localized upon the cerebral cortex—a subject upon which extensive researches have been made by Fritsch and Hitzig, Ferrier and Horsley. Ehrenberg of Berlin appears to have been the first to describe, in 1833, the large cells of the cerebral cortex and of the spinal cord. The axis cylinder process of nerve cells was discovered by Wagner of Göttingen, Marshall Hall (q.v.) of London was the first to demonstrate reflex movements, Prochaska to discover the differential function of the anterior and the posterior roots of the spinal nerves. By degeneration experiments instituted by Waller, by noting the myelination of nerve fibres as done by Flechsig, and by comparative studies it became possible to trace in the central nervous system the paths by which sensations are received and motor influences discharged.

Improvements in technical methods finally made it possible to trace the processes of nerve cells to their minutest ramifications. This gave rise to the neurone theory, which holds that the nervous tissue is composed of independent cells or neurones that may ramify extensively, some of the ramifications passing into nerve fibres and forming their active conducting elements. This theory has been applied with success to explain the architecture of the nervous system—a subject that is widely engrossing the minds of anatomists, and from which important results are expected in the future.

In the organs of special sense the new ideas of the constitution of the nervous system have elucidated many difficult problems. The anatomy of the ear has been studied by Rüdinger, Helmholtz (q.v.) of Berlin, Retzius of Copenhagen, and Ayers of Cincinnati. The organ of Corti was discovered by the Marchese di Corti in 1851. Schwalbe of Strassburg first saw the taste-buds of the tongue in 1867, Meissner and Wagner the tactile corpuscles in 1852. Galgi described the nerve endings in tendons in 1878, and Ruffini those of the fingers in 1893. The

teeth have been a special object of research with the American anatomists Ryder, Osborn, and Cope, especially with reference to the mechanics of their development.

The researches of American anatomists have borne fruit in other fields. W. E. Horner of Philadelphia discovered the tensor tarsi, or deep layer of the orbicularis palpebrarum, and William Clay Wallace of New York was the first to show the real nature of the ciliary muscle (1835). E. C. Spitzka of New York made important additions to our knowledge of the anatomy of the nervous system. It is to Henry J. Bigelow of Harvard University that we owe the first accurate description of the ilio-femoral ligament of the hip-joint and its application to the reduction of dislocations. His work on the hip, published in 1869, completely revolutionized surgical practice in this matter. It should not be forgotten, however, that Reid, of Rochester, N. Y., had previously, in 1851, shown many of the facts afterward more completely stated by Bigelow. In the realm of comparative anatomy, and especially of palæontology, Joseph Leidy, O. C. Marsh, Harrison Allen, and Edward D. Cope have done much to extend the fame of American science.

Bibliography. Among the recent works on human descriptive anatomy may be mentioned: Quain, Gray, and Morris, in English; Testut and Poirier, in French; Gegenbaur and Rauber, in German. On topographical anatomy, McClellan and Treves, in English; the American *Surgical Anatomy* of Deaver; Tillaux, in French, and Hyrtl, Gerlach, and Merkel, in German, are good works. There is no satisfactory treatise on the history of anatomy. A fairly complete résumé is found in vol. i of *The Reference Handbook of Medical Sciences* (New York, 1913). See ABDOMEN.

ANATOMY, COMPARATIVE. The science that treats of the structure of organisms with the aim of discovering their evolutionary history and of determining what parts are fundamental and primary and what have undergone modifications due to functional changes. This, at least, has been the aim of comparative anatomy since the doctrine of evolution has guided anatomical research. In the early half of the nineteenth century the aim of comparative anatomy was to assist taxonomy, or the natural classification of organisms, by giving a basis for separating the more essential parts (to be used as the basis of the larger groups) from the less essential parts (the basis of the smaller groups). In the latter half of the nineteenth century the aims of comparative anatomy were fostered by the newer science of comparative embryology, which added a new source of evidence for tracing evolutionary history. Together these sciences constitute comparative morphology. In this work the facts which might have been brought together into a general article under this title are distributed under more special headings. Thus, for the history and general scope of comparative anatomy, see ANATOMY; for the comparative anatomy of the several parts of the body, see respectively SKELETON; ALIMENTARY SYSTEM; MUSCULAR SYSTEM; NERVOUS SYSTEM; CIRCULATORY SYSTEM; RESPIRATORY SYSTEM; REPRODUCTIVE SYSTEM; EXCRETORY SYSTEM, and similar titles in connection with human anatomy and physiology, and in zoölogy and embryology. Consult: Cuvier, *Leçons d'anatomie comparée* (1st ed., 5 vols., Paris, 1800-05; 2d ed., 8 vols., 1836-44); Meckel,

System der vergleichenden Anatomie (Halle, 1821-29); Owen, *Comparative Anatomy of Vertebrate Animals* (4th ed., London, 1871); Huxley, *Anatomy of Invertebrates* (London, 1877); Huxley, *Anatomy of Vertebrate Animals* (London, 1871); Gegenbaur, *Elements of Comparative Anatomy* (trans., London, 1878); Wiedersheim, *Comparative Anatomy of Vertebrates* (trans., London, 1898); Wiedersheim, *Lehrbuch der vergleichenden Anatomie* (Jena, 1866); Lang, A., *Textbook of Comparative Anatomy* (of Invertebrates) (trans., London, 1891-96).

ANATOMY OF ABUS'ES, THE. A work by the Puritan Philip Stubbes, published in 1583, condemning many of the customary amusements of the time. A reply to it, by Nashe, was entitled *Anatomic of Absurditie* (1589).

ANATOMY OF MEL'ANCHOLY, THE. A celebrated and curious work by Robert Burton (1577-1640), first published in 1621 and many times thereafter. It treats, as its full title explains, of "all the Kindes, Causes, Symptomes, Prognostickes, and Severall Cures" of melancholy. It appeared under the pseudonym of Democritus Junior, a name which indicates its author's attitude. There is an extended preface, not the less interesting for being autobiographical. The body of the book is in three methodically arranged parts, dealing successively with (1) the causes and symptoms of melancholy; (2) its cure; (3) amorous and religious melancholy. Throughout there are a wealth of historical and literary lore and a quaint and penetrating humor, which have made the book a favorite with many of the finest minds. Dr. Johnson and Charles Lamb especially have recorded their admiration of it. The five editions succeeding the first one included changes of text by Burton himself. Since his time it has been variously abridged.

ANATOMY OF PLANTS. See MORPHOLOGY.

AN'AXAG'ORAS (Gk. Ἀναξαγόρας) (c.500-428 B.C.). The last great philosopher of the Ionian school. (See GREEK PHILOSOPHY.) He was born between 500 and 496 B.C. at Clazomenæ, in Ionia, the son of Hegesibulus. His family was wealthy and distinguished, so that the young Anaxagoras was able to devote himself to intellectual pursuits. Soon after the Persian Wars he moved to Athens, where he lived and taught many years, thus transplanting philosophy from Ionia to Attica, which was destined to be its home for many centuries. Among his pupils were some of the most distinguished Athenians, Pericles, Euripides, possibly Socrates and Archelaus. But after about 30 years' residence he was charged with impiety toward the gods, apparently by the opponents of Pericles, who took advantage of Anaxagoras's novel explanations of natural phenomena to injure the statesman through his friend. The eloquence of Pericles, however, secured a reduction of the sentence from death to banishment for life, and Anaxagoras, after some wanderings, settled at Lampsacus, on the Hellespont, where he died in 428 B.C.

The teachings of Anaxagoras cannot be exactly determined in all points. Of his work *On Nature*, in which he set forth his system, we have only fragments. But it is clear that he made a distinct advance over the earlier Ionian philosophers in that he defined a new principle, *intelligence* or *mind* (*νοῦς*), as operating on *matter*, thus introducing a dualistic explanation of the universe in contrast to the materialistic monism

of his predecessors. This dualism was further developed by Plato and Aristotle. The varied processes of change, growth, and decay were apparently explained to be the combining and separating of matter under the directing influence of intelligence. It was taught that matter is single in its nature and consists of an infinite number of invisible atoms inconceivably small (*σπέρματα*, 'seeds,' named *ὁμοιομερῆ* by Aristotle); these in their original condition make the unformed primitive material, existing in mass and possessing no characteristics. When acted on by intelligence, they form the individual objects we see about us; i.e., bars of gold, or iron, or copper are made up of the same material, but in each case intelligence has caused a result different from the others; and further, the processes of change produced by the spiritual principle are what we call natural phenomena. Intelligence acts from a point, the pole, setting the "seeds of matter" into spherical motion. By this movement the lighter parts are separated from the heavier, the former to be the clear, glowing upper air (ether), the latter to gather in the centre, and, by cooling, to become water, earth, stones, and minerals. The heavenly bodies are masses of stone cast from the revolving earth into the fiery ether, where they are heated and continue their courses, the sun being a mass larger than the Peloponnesus. Anaxagoras's notions with regard to the moon's light, the cause of the rainbow, of winds, and of sound were fairly accurate. Plants, the lower animals, and man, he said, owe their existence and continued life to the Supreme Intelligence which resides in them. In his doctrine of atoms, his "seeds," Anaxagoras approaches the teaching of the Atomic school. (See DEMOCRITUS.) Naturally Anaxagoras did not conceive the nature of his spiritual principle clearly enough to be able to explain details satisfactorily, as Aristotle remarks in his *Metaphysics*; but his great service was that he turned philosophy from thought about things to the consideration of thought itself, and made that one of the most important subjects of speculative inquiry thereafter. Anaxagoras was also classed by Eudemus among the Greek geometricians. Plutarch ascribes to him a work on the quadrature of the circle and asserts, on the authority of Vitruvius, that he wrote a treatise on perspective. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893); Diehls, *Doxographi Græci*; Gomperz, *Greek Thinkers*. The fragments have been edited by Schaubach (Leipzig, 1827); Schorn (Bonn, 1829); Ritter and Preller, *Historia Philosophiæ* (7th ed., Gotha, 1888); and Lange, *History of Materialism* (Eng. trans., Boston, 1886).

AN'AXAR'CHUS (Gk. Ἀνάξαρχος, *Anaxarchos*). A Greek philosopher, follower of Democritus, inclined to skepticism. He was a native of Abdera, and accompanied Alexander the Great in the Asian expedition and was highly prized by him as a counselor and friend. He is said by Cicero to have been cruelly put to death by the Cyprian prince Nicocreon. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893); Gomperz, *Greek Thinkers*.

ANAX'IMAN'DER (Gk. Ἀναξίμανδρος, *Anaximandros*) (610-546 B.C.). A Greek mathematician, astronomer, and philosopher. He was born at Miletus, the son of Praxiades, and was a disciple and friend of Thales, whom he succeeded as the head of the Ionian school. (See GREEK PHILOSOPHY.) He is said to have dis-

covered the obliquity of the ecliptic and certainly taught this doctrine. He appears to have been the first to introduce in Greece the *gnomon* (an instrument for determining the solstices) and the *polos* (sun-dial). The invention of geographical maps is also ascribed to him. According to Simplicius and Diogenes, Anaximander approximated the size and the distances of the planets, constructed astronomical globes, and wrote in prose a work on geometry. He seems to have conceived of the universe as a number of concentric cylinders, of which the outer is the sun, the middle the moon, and the innermost the stars. Within all these is the cylindrical earth. As a philosopher, he speculated on the origin (*ἡ ἀρχή, hē archē*) of the phenomenal world, and found that origin in the infinite or in the limitless, or the indeterminate (*τὸ ἄπειρον, to apeiron*). This principle of Anaximander is generally supposed to have been much the same as the chaos of other philosophers. By it Anaximander meant an endless unlimited mass undetermined by qualities, in no way subject to age or decay; it embraced all things and gave them motion. Through this motion the world came into being. When destroyed, things were absorbed again into the indeterminate. From his basic principle he conceived all opposites, such as hot and cold, dry and moist, to proceed through a perpetual motion and to return to it again. Of the manner in which he imagined these opposites to be formed, and of his hypothesis concerning the formation of the heavenly bodies from them, we have no accurate information. It would seem, however, that he did not believe in the generation of anything in the proper sense of the word, but supposed that the infinite atoms or units of which the *ἀρχή*, or primary matter, is composed, merely change their relative positions in obedience to a moving power residing in it. Consult: Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893); Gomperz, *Greek Thinkers*; Diehls, *Doxographi Græci*; Neuhäuser, *Anaximenes Milesius* (Bonn, 1883).

ANAXIMENES, ăn'ăks-ĭm'ê-nēz (Gk. Ἀναξίμενης). A Greek rhetorician and historian, born in Lampsacus, Asia Minor, in the fourth century B.C. He was a pupil of Zōilus and Diogenes the Cynic; is said to have taught Alexander rhetoric and to have accompanied him in the Persian expedition. He wrote histories of Philip of Macedonia, of Alexander, and of Greece, of which a few fragments exist. The history of Greece, in 12 books, began with the origin of gods and men and was carried down to the battle of Mantinea. The rhetoric addressed to Alexander, found among the writings of Aristotle, has also, since the sixteenth century, been attributed to him; it is independent of Aristotle's *Rhetoric* and may have been published before that work. Consult: Spengel, *Rhetores Græci* (Leipzig, 1847); Cope, *Introduction* to his edition of Aristotle's *Rhetoric*; Ipfelkofer, *Die Rhetorik des Anaximenes* (Würzburg, 1889). Only fragments of the work, which deals with the practical art of oratory, exist.

ANAXIMENES. A Greek philosopher, who was born at Miletus, in Asia Minor, and flourished about 546 B.C. He was a pupil of Anaximander (q.v.). He held air, which is so necessary to life, to be the first cause of all things, or the primary form of matter, from which all things are formed by compression or by rarification; all things, therefore, are forms of air,

differing from one another in the degree to which the air has been compressed. He followed Anaximander, then, in seeking a first principle (*ἀρχή*) as the cause of all things; he differed from him in finding that principle in a particular element. Consult: Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893); Diehls, *Doxographi Græci*; Gomperz, *Greek Thinkers*.

AN'BURY (probably from AS. *ange*, vexation, trouble + *berry*). A disease of cabbage, turnips, and other cruciferous plants. See CLUB ROOT.

ANCACHS, ăn-kăehs'. A maritime department of Peru, bounded by the department of Libertad on the north, Huánuco and Junin on the east, Lima on the south, and the Pacific on the west (Map: Peru, B 5). The greater portion of the surface is mountainous, but there is some good arable land. The mineral deposits are reputed to be important, but are little worked. Cattle raising and agriculture are prominent industries. There is a railway line running through the State from Chimbote to Huaráz, the capital. Area, 16,500 square miles. In 1896 the population was estimated to be 428,703.

ANCÆ'US (Gk. Ἄγκαιος, *Ankaios*). A name of two of the Argonauts (q.v.) of Greek legend. 1. A son of Poseidon, who became steersman of the Argo after the death of Tiphys. He is noted for the prophecy that he should not live to taste wine from his own vineyard. At the moment when at length he did lift a cup of its vintage he was told that "there's many a slip 'twixt the cup and the lip," and just then the noise of a wild boar which had got into the vineyard called him away. He was killed by the animal and so fulfilled the prediction. 2. A son of Lycurgus the Arcadian. He was killed by the Calydonian boar.

ANCELOT, ăns'lô', JACQUES ARSÈNE POLYCARPE (1794–1854). French dramatist, novelist, and poet, born at Havre, who won fame and a pension in 1819 by his tragedy *Louis IX*. His other serious dramas are not noteworthy; but an epic, *Marie de Brabant*, and a novel *L'homme du monde* (1829), attracted attention. The Revolution of 1830 cost him his pension, and he became a fertile purveyor of light dramas, farces, and vaudevilles of doubtful morality. Very readable are the graceful verses of his epigrammatic satires, *Epîtres familières* (1842); but *Louis IX*, his first considerable work, remains his best. He was admitted to the French Academy (1841). He had already received (1825) the cross of the Legion of Honor. His wife, Marguerite Louise Virginie Chardon (1792–1875), collaborated with him and wrote independently plays and novels.

AN'CESTOR (ME. *ancessour*, from Lat. *ante-cessor*, a predecessor, foregoer). In the English law of inheritance, the person from whom one may inherit real property. It is the correlative of "heir." The term is sometimes loosely used as signifying a progenitor; but properly, in legal usage, an ancestor need not be a progenitor, as one may inherit from his collateral relatives as well as from an ancestor in the direct line. See HEIR; SUCCESSION.

ANCESTOR WORSHIP. Religious regard paid to forefathers, actual or supposed. A brief statement of the distribution of ancestor worship will also serve to indicate the various forms assumed by that cult. We find it in Polynesia and Melanesia, where ancestral cults appear in

most diverse aspects, from a rudimentary offering consisting of some food thrown backward over one's head in the course of a meal, to elaborate rituals with special priests and shrines. Among the South African Bantu ancestor worship appears in the guise of a religious regard paid to animals in whom ancestral souls are believed to be incarnated. In Ashanti and Dahomey the cult of ancestors has taken the form of elaborate burials (especially in the case of kings) associated with monstrous bloody sacrifices. In Egypt the regard for ancestors led to an unprecedented development of the art of embalming and preserving the corpse, as well as to high architectural achievement. In India we find, perhaps, the purest spiritual type of ancestor worship; whereas in China the cult was intimately associated with the institution of the family and exerted a far-reaching influence on the social life of the people.

Ancestor worship as a most important type of religion and ritual was first brought into prominence by Herbert Spencer, who regarded the most primitive form of ancestor worship, namely, the fear of the ghost, as the root of all religion from which nature worship, fetichism, idolatry, and all the higher forms of religion had sprung. Spencer's derivation of animal worship from ancestor worship, the so-called "misinterpretation of nicknames" theory, enjoyed for a time great notoriety if not recognition. In that theory Spencer made use of the well-known tendency of savages to apply animal names as nicknames. This and the alleged inability of primitive language and primitive thought to differentiate between a name and a thing named, led to the belief in animal ancestry. The descendants of a man called "Wolf," after the lapse of two or three generations, deemed themselves the descendants of a wolf, etc. If the ancestor had been famed for his character or achievements, religious regard would be paid to his memory. Thus a cult of the wolf would arise.

Spencer's position was very popular towards the end of the last century, but it cannot be sustained in the light of more recent knowledge. Whereas fear of the dead is, no doubt, a common feature in primitive life, it is far from being universal. Ancestor worship, moreover, is not found among the most primitive tribes, and the more pronounced varieties of the cult occur only among peoples who are fairly advanced. In view of the multiplicity of sources from which religious emotions and rites may develop, it is quite artificial to look for the source of all religion and of all cult to the worship of ancestors. Animal worship and nature cults must have developed innumerable times from other sources than ancestor worship, and often, no doubt, in the absence of the latter. Sir Henry Maine was probably right in maintaining that a strong development of the family was a necessary condition of genuine ancestor worship.

Various beliefs and cults may bear a superficial resemblance to ancestor worship, a resemblance, which, on analysis, proves illusory. Thus the *Di Manes* of the Romans must probably be conceived as undifferentiated hosts of disindividualized spirits. The propitiation of the dead at burial may not be designed to honor the dead, but to purify the living (as in early Rome). On the other hand, ancestor worship may be disguised in the form of another cult,

as happens in the case of the Bantu referred to before. An important part in ancestral cults is often played by different kinds of burial: inhumation, deposition in urns, aerial burial, etc. See BURIAL.

Intimately associated with ancestor worship, although not coextensive with it, are the beliefs in a future life and in immortality. On these topics, as well as on ancestor worship proper, consult J. G. Frazer's Gifford Lectures on *The Belief in Immortality and the Worship of the Dead*, vol. i (1913).

A possible, although not a necessary, development of ancestor worship is idolatry.

For Greek, Hebrew, Persian, etc., ancestor worship, see general articles under these headings.

ANCHIETA, ăn-shyă'tă, JOSÉ DE (1533-97). A Portuguese Jesuit missionary, called "Apostle of Brazil"; related to Loyola. He was born at Luguna, in Teneriffe, Canary Islands, and in 1553 went to Brazil, where he founded the first college for the conversion of natives and was appointed Governor of the converted Indians. Both the Portuguese and savages ascribed to him the working of miracles. He died near Espirito Santo. His work on the *Natural Productions of Brazil* was published by the Academy of Sciences at Madrid and was reprinted in Lisbon in 1812. Consult Rodriguez, *Vida del Padre J. de Anchieta* (1618), and Vaseoncellos, *Vida do Padre Joseph de Anchieta* (1620).

ANCHISAURUS, ăn'kī-să'rūs (Gk. ἄγκυρι, *anchi*, near + σαῦρος, *sauros*, lizard). The best-known of the dinosaurian reptiles that lived on the marshes, flood-plains, and beaches of the Connecticut estuary during the Triassic period. Two species are known, quite perfect skeletons of both of which have been found; the larger, *Anchisaurus colurus*, having had a slender, delicate body about 6 feet long, which length is hardly one-tenth that of many of the enormous dinosaurs found in the Jurassic rocks of the Western States. These carnivorous Anchisauri had small, bird-like heads with large eyes and beaked jaws, each provided with 18 teeth, and had long, slender, bird-like necks. The form and number of the bones of the tail indicate that this member was slender, round, and usually carried free from the ground. Anchisaurus, with its short fore legs, that seldom touched the ground, and its four-toed hind feet, the first digits of which were so weak as to render them incapable of making impressions upon the firm, moist sands of the beach, was in all probability the reptile that made many of the well-known "bird-tracks" of the Connecticut Valley sandstone. See DINOSAURIA.

ANCHISES, ăn-kī'sēs (Gk. Ἀγχίσσης, *Anchisēs*). In Grecian legend, a descendant of the royal house of Ilium (Troy) as grandson of Assaræus, and the father by Aphrodite (Venus) of the Trojan hero Æneas. He had been commanded not to reveal the maternity of the child, but disclosed the secret to his companions, and was made blind and crippled (one legend says killed) by lightning from Zeus. At the fall of Troy his son bore him away on his shoulders, and Vergil describes their voyage to Italy and Sicily, where the old father died and was buried at Drepanum (Trapani). Engraved Roman gems frequently picture Æneas carrying Anchises out of Troy; one fresco at Pompeii showed the same scene.

ANCHITHERIUM, ăn'kī-thē'rī-ŭm (Gk. ἄγκυρι, *anchi*, near + θηρίον, *thērion*, wild beast). One

of the three-toed fossil horses of Middle Miocene Tertiary time, remains of which have been found in North America and Europe. The animal was of the size of the Shetland pony, and had the middle toe of each foot well developed, while the lateral toes, one on each side of the middle toe, though of a length sufficient to reach the ground, were of such delicate construction as to be incapable of supporting any weight. Anchitherium was at one time thought to be one of the ancestors of the modern horse, but is now considered to represent an offshoot from the main line of evolution of the horse, although it lived at the same time and in company with the direct horse ancestors. A complete skeleton of Anchitherium affine, found at Pawnee Buttes, Colo., in 1901, is on exhibition in the American Museum of Natural History in New York City. For descriptions of other forms of fossil horses, the reader is referred to the article on HORSE, FOSSIL.

AN'CHOR (Lat. *ancora*, Gk. *ἄγκυρα*, *ankyra*, akin to Eng. *angle*; literal meaning, 'something crooked, hooked'). A heavy instrument designed to rest on the sea bottom, and, by means of a cable or rope, hold a vessel, buoy, or other floating object in a desired position. Anchors for buoys frequently consist merely of heavy blocks of stone or of concrete, but those for ships are now almost invariably of iron or steel. Many forms of anchors were used by the ancients. The earliest consisted of stones, or baskets of stones, which acted merely as weights without hooking into the ground; these were followed by hooked sticks, weighted to make them sink and having only one arm. Other arms were eventually added, so that the anchors resembled the modern grapnel. The earliest recorded use of anchors was by the Egyptians on their Red Sea galleys, while the Greeks are credited with having used the first iron anchor. Greek vessels had several anchors, one of which, called the "sacred anchor," was never let go until the ship was in dire distress; and a similar custom was, for many years, observed in the British navy. All sea-going vessels ordinarily carry several anchors. Two of these, at least, are carried well forward, one on each bow, and are therefore called *bowers*, and are designated as the *port bower* or *starboard bower*, according to the side of the ship on which they are carried. In addition to these, large vessels carry one or two anchors of about the same size, called *sheet anchors*. They are stowed like the *bowers*, but usually some distance farther, aft, and, not being intended for immediate use, are generally securely lashed in place.

A *stream anchor* is a light anchor, not more than half as heavy as one of the *bowers* and usually about one-fourth. It is often very useful. Very light anchors are called *kedges*. In the United States navy the weight of a battleship's bower or sheet anchor is from 14,000 to 18,000 pounds. Stream anchors (the term "stream" is not now much used) weigh from 1,000 to 3,000 pounds, and *kedges* from 100 to 1,000 pounds. Smaller anchors are carried for the boats. For the purpose of grappling and holding to such objects as a vessel's rigging, trees on shore, chains, and the like, a small instrument called a *grapnel* is used. It has no stock, but has several arms, each sharply pointed. They were much used in "cutting out" expeditions in the days when such enterprises were common. The grapnel, with a short length

of chain attached, as the enemy would have severed a rope with their cutlasses, was thrown into the rigging of the ship attacked. This enabled those of the attacking party, in a tide-way, or when the ship attacked was moving, to keep alongside until they could clamber on board. Grapnels are still issued for use in boats in the United States navy, and a large folding grapnel, with straight hinged arms, is used to some extent in naval boats in place of an anchor of the customary shape. Anchors were formerly made of wrought iron, but are now very largely made of cast or forged steel. There are two types in use, the old, or ordinary type, in which the stock is at right angles to the arms, and patent anchors, which either have no stock at all, or one lying in the same plane with the arms. The shape of the ordinary anchor is familiar, and is shown in Fig. 1.

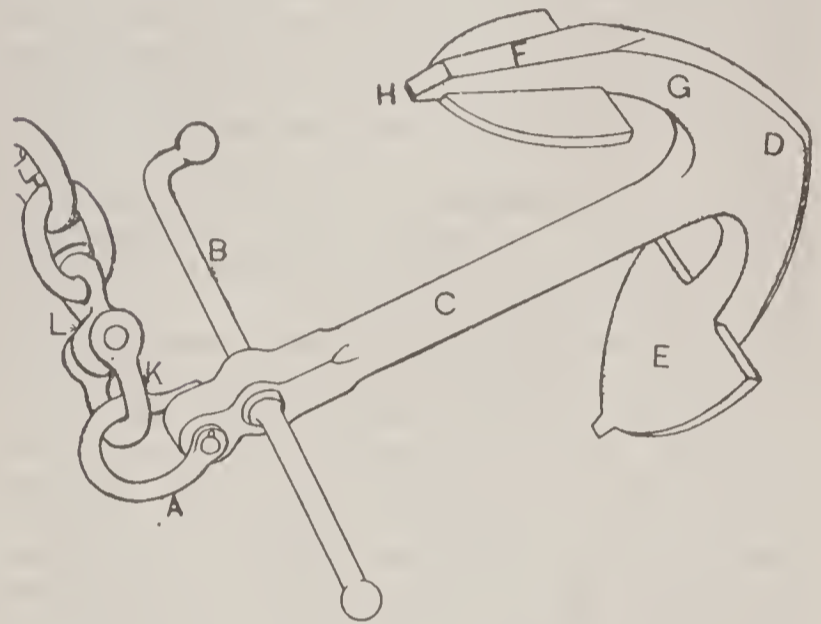


FIG. 1. ANCHOR.

- | | | | |
|---|-------|---|---------------------|
| A | Ring | F | Fluke |
| B | Stock | G | Arm |
| C | Shank | H | Bill |
| D | Crown | K | Shackle or Jewsharp |
| E | Palm | L | Club-link |

The main body is called the *shank*; at one end it joins the arms, and at the other is pierced by a hole through which passes the iron (or steel) *stock*. The latter has a ball cast on one end; the other end is bent at right angles a few inches from its extremity, and also terminates in a ball, but the ball is removable. The stock is held in position in the shank by a raised lug, or shoulder, on one side, and by a key on the other. The bend at the end permits it to be partly drawn out and folded down along the shank. At the other end of the shank from the stock are the *arms*, which are cast or forged

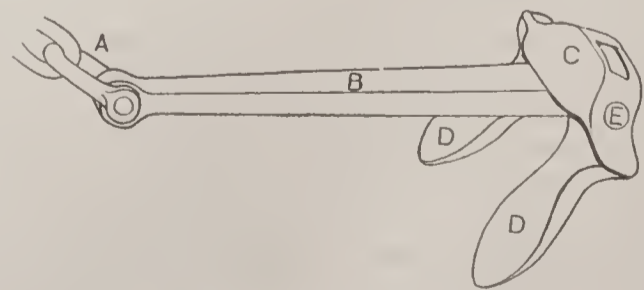


FIG. 2. PATENT ANCHOR.

- | | | | |
|---|-------|----|--------|
| A | Ring | C | Crown |
| B | Shank | DD | Flukes |
| | | E | Pivot |

in one piece with it. They taper slightly towards their ends, which are called *pees*, or *bills*, and on the side towards the shank have shield-shaped

pieces called the *flukes*. The faces of the flukes are called *palms*. The middle of the curve of the arms, opposite to and in line with the shank, is called the *crown*.

Patent anchors differ in details of design, but in all of them the arms are pivoted to the shank, usually by a very heavy bolt. The flukes are enlarged, and lie in the same plane with the arms and shank when the former are in mid-position. When the anchor is on the bottom, the arms turn, the flukes droop, and, pointed downward, are forced into the ground. To assist in preventing the anchor from being cap-sized by a side pull on the chain, some patent anchors are fitted with short stocks, which lie in the same plane as the arms when the latter are in mid-position. When an anchor of ordinary type is let go, it strikes on the crown and then falls over and rests on one end of the stock. The first pull of the chain *cants* it (i.e., tilts it over), laying the stock flat on the bottom and pointing one of the bills fair for entering the ground. Additional pulls serve to drive the bill and fluke into the ground to a depth which depends upon the strain upon the chain and the softness of the bottom. The principal points of excellence in an anchor are: Holding-power under various conditions, strength, quick-holding, quick-tripping, exemption from fouling, facility of stowing, facility of sweeping, canting, facility of fishing in a heavy sea, and facility of transport in, or by, boats. Slight differences of design make considerable difference in the holding-power of anchors. For an ordinary anchor the most favorable angle for the palm is thought to be a little less than 45 degrees from the middle line of the shank, but in most patent anchors the flukes are permitted to droop not more than 35 degrees. The shank of all anchors projects a short distance beyond the stock, where it is fitted with a heavy ring or shackle called the *ring*; the ring in turn is secured to the chain by a heavy shackle called the *jewsharp*, the jaws of which embrace the club, or body, of a *club-link*; beyond this there is sometimes an open link, and then follows the *chain*. The latter differs from ordinary chain in having a cross-piece in each link called a *stay pin*, the purpose of which is to prevent the chain from *kinking*, to which ordinary chain is liable, and which would be a most serious matter in an anchor chain, because it not only might cause the chain to part under the pull of the ship, but in letting go the anchor a *kink* formed in the *chain-locker* (the box or compartment in which the chain is stowed) might jam in a chainpipe in the deck, or in the hawsepipe, with disastrous consequences.

In the navy and in most vessels of the merchant service the anchor chain was formerly divided into lengths of 15 fathoms (or 12½ fathoms in England), called *shots*, each shot being joined to the succeeding one with a shackle. At 7½ fathoms from the anchor, and again at 37½ fathoms, were placed swivels, to prevent the chain from getting kinks by twisting. In the United States navy the present practice is to place a swivel at 5 fathoms and neither shackle nor swivel between that and 45 fathoms. This is to facilitate getting up the anchor. Neither swivels nor shackles fit the wildcat closely, and, if the pull is heavy, they are apt to slip and cause delay. Merchant ships anchor less frequently and in less exposed places than those which men-of-war are frequently

compelled to accept for anchorage ground, consequently less attention is paid to the details of the *ground-tackle* (i.e., anchors, chains, etc.) of merchantmen. When expecting to remain in port for more than a few days, especially if the harbor or anchorage ground is contracted, or if there is a strong tidal or river current, vessels frequently resort to *mooring*. The length of chain varies with the depth of water and other considerations, but a moor at 45 fathoms is common practice. After dropping one anchor the ship *veers* (i.e., lets run out) chain until about 90 fathoms are laid out; then the other anchor is let go; now, by *heaving in* on the first chain to 45 fathoms and *paying out*, or veering on the second to 45 fathoms, the ship is brought to a middle position between her anchors, and in swinging to the tide or wind will cover very much less ground than if *riding* to a single anchor, and her chain cannot sweep over an anchor and *trip* it (i.e., cause it to let go its hold).

When the ship swings, however, she may not merely move back and forth, but may turn all the way round (e.g., heading north, she may swing until she heads east, then south, and then—instead of going back to east and then north—continue the circle by heading west and then north); this will cause the chains to cross, or if the operation continues, to wind themselves around each other and give what is called a *foul hawse*. This must be cleared by unshackling and unwinding one of the chains, the operation being called *clearing hawse*. To avoid the labor of this, and it is a very laborious task with heavy chain, a *mooring swivel* is frequently used. This is a swivel having two shackles at top and two at the bottom; the chains leading to both anchors are opened at the 45 fathom shackles, and the parts leading from the anchors *bent* (i.e., joined) to the lower shackles of the mooring swivel while the inboard ends (i.e., those extending from the ship) are bent to the upper shackles of the swivel. The ship is now free to swing without fouling her chains, as the swivel turns with her.

Patent anchors are much used, as they are convenient in more ways than one. When on the bottom, there is no arm sticking up in which the chain can catch as the ship swings, or on which she might strike if the water is shallow. When hoisted, the absence of a stock at right angles to the arms facilitates storage; and in most recent ships the anchor is pulled up, without *catting* or *fishing*, into a recess for it in the bow, which is made by enlarging the hawsepipe. Anchors are hoisted by means of a capstan or windlass. The former is shaped somewhat like a huge hour-glass, but is stouter in the middle, and carries about its lower edge a recess with ridges on the upper and lower flanges; this arrangement, in which the chain fits, is called the *wildcat*. Windlasses are like capstans, but are turned on the side, and usually have two or more wildcats. On vessels in which steam gear is not fitted to the capstan, the latter is turned by hand; long wooden bars, called *capstan bars*, are fitted into recesses in the head of the capstan and held in place by a small rope called the *swifter*, which passes through a score, or groove, in their outer ends. Small windlasses are operated by levers like pump brakes, which turn the windlass barrel by means of racks and pawls. In the older ships the first operation of getting up the anchor consists in *bringing-to* the

chain (i.e., in pulling up slack chain from the locker and putting it in the wildcat of the capstan); large ships are now usually fitted with steam windlasses, on which the chain is always in place. The next process is to release the chain from the *bitt* and *stoppers*. The former is a heavy, cylindrical iron casting securely bolted to the deck; in the older ships the chain usually has one turn around it, but when the ship is pulling heavily at her anchor, owing to a strong current or heavy sea, the chain is *double-bitted* (i.e., has two turns). The *stoppers* are short lengths of heavy wire rope hooked to rings in the deck at one end and lashed with rope to the chain at the other; there are usually several stoppers on the chain, and if there is no *controller* (an iron contrivance to hold the chain from running) forward of the bitts, a stopper must now be put on the chain there. The chain is then *unbitted* (i.e., thrown off the bitt); the slack is taken in until the strain is on the windlass, or capstan, and all stoppers taken off. The *heaving in* then begins; when the chain has been hove in until any further pull is liable to cause the anchor to trip, or the ship to drag, it is said to be *hove short* or *at a short stay* (the terms *astay* and *at a long stay* are not much used); and its direction, making an angle of about 45 degrees with the surface of the water, is about parallel to the fore stay of a rigged ship.

If everything is ready for leaving the anchorage, the heaving continues until the chain is vertical, or, in nautical terms, *up and down* (the anchor is then said to be *apeak*), the anchor is *broken out* and hoisted to a convenient position at or into the hawsepipe, when it is said to be *up*.

In old-typé ships a tackle called the *cat* was next used; a hook on the lower block of the *cat-fall* was inserted in the ring of the anchor, and the latter was *catted* by being pulled up to the *cathead*, which projected slightly from the ship's side; the *fish* tackle was then hooked to the crown, and the other end of the anchor pulled up until the shank was about horizontal and the inboard arm rested on an inclined iron plate called the *bill-board*, the latter operation constituting *fishing*. The anchor was now secured by small chains, one in the ring called the *ring-stopper*; and the other, around the shank close to the outboard arm, called the *shank painter*. One end of each of these chains led to a trigger, by striking which the anchor was *let go* with ease and certainty. Under some circumstances it was desirable to *cockbill* the anchor before letting it go. This was done by easing away the shank painter until the anchor hung at the cathead by the ring-stopper; it was then said to be *a-cockbill*. In later ships there was secured on the shank of the anchor, at the balancing point, a link called the *balance-link*. When the anchor was hove up to the hawsepipe (i.e., the cast-iron pipe in the ship's bow through which the chain passes), the cat was hooked to the balance-link, and the anchor lifted in a horizontal position and put in place on the bill-board. Instead of a cathead, this form of cat requires a heavy *cat davit*, or derrick, standing 8 or 10 feet above the deck, and mounted upon a swivel stand. In modern ships cat and fish davits and derricks are unnecessary, as the anchor is pulled directly into the hawsepipe. In *letting go* the anchor it is necessary to control the speed of the chain as

it goes out. For this purpose it was formerly *bitted* (single-bitted, with one turn around the bitt); this prevented the velocity of the chain from becoming too great. When a sufficient quantity of chain had run out, the brake was put on the windlass, and the *compressor* (a curved arm which grips and holds the chain) *hauled to*. The stoppers were then put on and the chain was *secure*. In recent ships the windlass or capstan brake suffices to check or stop the chain.

A *sea anchor* is variously constructed; usually it floats, and is made up of spars and canvas, or something that will not sink and will offer resistance to the water; but it is sometimes made of materials too heavy to float and is then held up more or less by the pull on the anchor rope. Its object is to keep a boat or ship with her bow up to the seas and so enable her to ride them better and roll and wallow about less; and it accomplishes this by being placed in or below the surface of the water, so that it tends to drift more slowly than the boat or ship which is exposed to the force of the wind and of the waves.

Mooring anchors are of various types and are designed for permanent moorings; they are used for holding in place large mooring buoys to which ships may secure themselves in lieu of anchoring, or as anchors for buoys marking a channel or shoal. As has already been stated, some mooring anchors consist merely of a heavy stone, or block of concrete, but others are of the mushroom, or screw, form.



FIG. 3.
MUSHROOM
ANCHOR.

Mushroom anchors of one type have a saucer-shaped head, from the concave side of which extends the shank, which has a shackle in the end for the chain; the other type consists merely of the iron saucer, with the shackle on the convex side; in this second type the anchor holds largely by suction.

Screw anchors, as their name implies, are shaped like screws with very broad flanges and are screwed down into the mud by means of a long bar called the *key*.

AN'CHORAGE, or ANCHORAGE GROUND. That portion of a harbor or roadstead best suited for anchoring vessels; or, in harbors where there is much commerce or traffic, that portion in which vessels are permitted to anchor. A good anchorage is one in which the water is of sufficient but not excessive depth; in which the bottom is of such a character as to enable the anchor to enter in and hold (i.e., the *holding ground* is good), and which is protected from the open sea. The practice of indicating upon charts by means of an anchor the best anchorage in any particular locality still obtains, but is falling somewhat into disuse, owing to the more definite information now given by charts and sailing directions.

AN'CHOR CHAIN. See ANCHOR.

ANCHOR DAVIT. See ANCHOR; DAVIT.

ANCHOR ICE. See ICE.

AN'CHORITE, or AN'CHORET (Gk. ἀναχωρητής, *anachōrētēs*, a recluse, retired man, from ἀνά, *ana*, back + χωρεῖν, *chōrein*, to give way, retire). Literally a person who withdraws from society; a hermit. The name was applied to those hermits who began to appear in the Christian Church in the third century,

living in solitude, and not, like the monks or cenobites, in communities. During the first two centuries Christians generally thought it enough to withdraw from the world by refusing to participate in heathen festivals and amusements; but extreme views became gradually prevalent, and were connected with a belief in the merit of celibacy, of abstinence from particular kinds of food, of self-inflicted tortures, etc. The persecutions to which Christians were subjected drove some into the solitude of deserts; afterward the glory of a life spent in loneliness and austerity became a substitute for that of the martyr's death. The general corruption of society also caused many earnest and well-meaning persons to shun it. The ascetics (see ASCETICISM) set the example of retiring from cities to rural districts and villages; the anchorites went further, and sought to withdraw themselves altogether from mankind; and if the reputation of sanctity which was connected with a life of solitude constituted its chief attraction to some, there can be no doubt that many chose it in the hope of thereby attaining real sanctity. Many of the anchorites voluntarily subjected themselves to the vicissitudes of the weather, without proper habitation or clothing, restricted themselves to coarse and scanty fare, wore chains and iron rings, and some dwelt on the top of pillars for many years (see PILLAR SAINTS) as extraordinary and conspicuous examples of mortification and penance, of whom the most famous is St. Simeon Stylites in the early part of the fifth century. St. Antony of Egypt (q.v.) was one of the first and most celebrated anchorites. The deserts of Egypt were their first home. Thence they spread throughout the Eastern church, but were always rare in the Western church. The anchorites were not always able to preserve their solitude unbroken. The fame of their sanctity drew many to visit them; their advice was often sought; and the number of their visitors was much increased by the belief that diseases, particularly mental diseases, were cured by their blessing. Sometimes, also, they returned for a short time to the midst of their fellow men to deliver warnings, instructions, or encouragements, and were received as if they had been inspired prophets or angels from heaven. The number of anchorites, however, gradually diminished, and the religious life of convents was preferred to that of the hermitage.

AN'CHOR WATCH. A portion of the crew kept on deck during the night when at anchor. During prolonged heavy weather or unfavorable conditions the anchor watch may be kept on deck during the day. In the merchant service one or two men form the ordinary anchor watch; in the navy, four to a dozen or more; though in either case these numbers may be increased under special circumstances. The duties of the anchor watch are to *veer* chain (see ANCHOR), if occasion demands it, spread or take in awnings, cover hatches, secure loose articles if the wind and sea rise; and, in fact, act as a general guard when the greater part of the crew is asleep.

ANCHOVY, ăn-chō'vī (of uncertain origin, perhaps, literally, a dried or pickled fish, from Basque *antzua*, dry). A small fish (*Engraulis encrasiolus*) belonging to the Engraulididæ, a family closely related to the herring. It resembles the latter in general appearance, but is thicker in proportion, and is about 6 inches

in length, having a pointed head with the upper jaw projecting, and a widely forked tail. It abounds in the coast waters of southern Europe, and especially in the Mediterranean, where extensive fisheries are carried on, particularly near Leghorn. They approach the coast from the oceanic depths to spawn in early summer and are caught in seines, to which they are attracted by strong lights in the fishing-boats. Anchovies are salted in small barrels and have been much used for sauces, etc., since ancient times. There are several nearly related species both on the Atlantic and Pacific coast of America and in other countries, where they also form an important food preparation.

ANCHOVY (ăn-chō'vī) **PEAR** (so named from being pickled, see ANCHOVY), *Grias cauliflora*. A plant of the family Myrtaceæ. It grows in boggy places in the mountainous districts of Jamaica and other West Indian islands, attains a height of 50 feet, and has great oblong leaves 2 or 3 feet in length. The flowers are numerous, on short peduncles; they are large, whitish, and sweet-scented; the corolla consists of four petals, and the calyx is four-cleft. The fruit is an ovate drupe of a brownish russet color, crowned with the persistent calyx; the stone is marked with eight ridges. This fruit is pickled and eaten like the East Indian mango and resembles the mango in taste.

ANCHU'SA, ăn-kū'să. See ALKANET.

ANCHYLOSIS, ăŋ'kī-lō'sīs. See ANKYLOSIS.

AN'CIENT DEMESNE, dê-mên' (OF. *de-main*, Lat. *dominium*, Eng. *domain*). In English law, estates of great antiquity, constituting the ancient patrimonial possessions of the crown. Manors (q.v.) of ancient demesne date back to the reign of Edward the Confessor or of William the Conqueror, and appear in Domesday Book under the description of *Terræ Regis*. Though they might be alienated and held by a subject, they were properly kept in the King's hands for the maintenance of the royal dignity. Whether held by a subject or by the King, they enjoyed certain rights and immunities which were not shared by other manors, even when held by the King; especially the right to administer their own justice, free from the interference of the ordinary royal tribunals. Two important and distinctive varieties of tenure developed on these ancient demesne lands: one a privileged form of customary tenure (q.v.), midway between copyhold (q.v.) and socage (q.v.) tenure, which came to be known as *customary freehold*; and the other a peculiar form of socage tenure, which received the name of *tenure in ancient demesne*. Though these *tenures* still survive in England, they have been shorn of most of their peculiar characteristics and assimilated to the more usual tenures. Consult Pollock and Maitland, *History of English Law* (2d ed., London and Boston, 1899).

ANCIENT LIGHTS. Windows that have existed so long that they have acquired an indefeasible right to the light which enters them, free from interference by the owner of the premises over which the light comes. The easement of ancient lights, so called, is the right gained by the owner of a dwelling or other building to restrain his neighbor from interfering with windows which have been in existence from time immemorial. The term does not, therefore, describe a peculiar and distinctive right, but only a method by which the familiar easement of light may, like other easements, be acquired—

the method, namely, of prescription (q.v.). Ancient lights belong to the class of negative easements, which cannot generally be acquired by prescription in the United States. In England they are now regulated by statute (the Prescription Act, 2 and 3 Will. IV, c. 71), which dispenses with the old requirement of use and enjoyment from time immemorial and calls for an existence of only 20 years to create the easement. See EASEMENT; LIGHT, EASEMENT OF; PRESCRIPTION. Consult Gale, *Treatise on the Law of Easements* (8th ed., London, 1908), and Goddard, *Treatise on the Law of Easements* (7th ed., London, 1910).

ANCIENT MAR'INER, THE. A poem by Coleridge, published (1798) in the *Lyrical Ballads* by himself and Wordsworth. It is founded on the sailor's superstition of the sinfulness of killing an albatross and rehearses the sufferings consequently undergone.

ANCIENT OF DAYS. A designation of God in Dan. vii. 9, 13, 22. It represents him as "the aged," "the advanced in days," possibly in contrast with the new divinities Antiochus Epiphanes had sought to introduce among the Jews. In the Ethiopic Enoch the expression "head of days" is not a translation of the term in Daniel, for which the Ethiopic Bible uses another phrase, but probably inspired by it, meaning, not "the old head," but "the Lord of Days." Consult Schmidt, *The Original Language of the Parables of Enoch*, p. 343 (1908).

ANCIENT ORDER OF HIBER'NIANS. See HIBERNIANS, ANCIENT ORDER OF.

ANCIENTS, COUNCIL OF. The upper House of the Legislative Assembly in France, under the Directory, from 1795 to 1799. The chief function of the Ancients was the approval or rejection of measures submitted by the lower House, the Council of Five Hundred.

ANCILE. See SALII.

ANCILLON, ä'n'së'yôn', CHARLES (1659-1715). A French Protestant and educator, born in Metz. Having studied law at Marburg, Geneva, and Paris, he was chosen by his co-religionists to plead their cause before Louis XIV on the revocation of the Edict of Nantes. He is better known as an educator in Prussia, where, in 1687, he was placed in charge of the *Académie des nobles* by the Elector Frederick. With Leibnitz he founded the Academy of Berlin. His writings include *Histoire de l'établissement des Français réfugiés dans les états de Brandebourg* (1690).

ANCILLON, JOHANN PETER FRIEDRICH (1767-1837). A Prussian statesman and historian. He was born in Berlin, a descendant of David Ancillon (1617-92), a French Protestant, who emigrated from Metz after the revocation of the Edict of Nantes, and who became pastor of the French congregation in Berlin. Intermediate members of the same family occupied the same pastorate or were in the service of the Prussian government. Friedrich studied theology, philosophy, and history, and in 1792 was appointed teacher of history in the Berlin Military Academy, as well as preacher to the French congregation. The publication of his *Tableau des révolutions du système politique de l'Europe depuis le XV siècle* (4 vols., 1803-05) secured him the appointment as royal historiographer as well as tutor of the Crown Prince. In 1832 he became Minister of Foreign Affairs, and occupied that place until his death. He was a man of conservative views and a defender of the monarchy.

ANCKARSTRÖM, or ANKARSTRÖM, ä'n'-kär-strëm, JOHAN JAKOB (1762-92). The assassin of King Gustavus III of Sweden. He was a page at court and later an ensign in the Life-Guards, but in 1878 retired from military service with the rank of captain. Of haughty temper, angered at the policy of repression pursued by the crown toward the nobility, he was frequently brought to trial for incendiary speeches. In 1791, with Count Horn, Count Ribbing, Lieutenant-Colonel Liliehorn, and others, he formed a conspiracy for the murder of the King. Chosen by lot to accomplish the deed, at a ball held in the Stockholm opera-house, he approached the King and mortally wounded him with a shot from a pistol (March 16, 1792). He was condemned to death and executed at Stockholm.

ANCON, ä'n-kön', or PORT ANCON. A seaport of Peru, in the department of Lima, 30 miles by rail northwest of Lima. During the construction of a coast-line railway excavation near Ancon brought to light an old burial place in which were found articles illustrating many branches of ancient Peruvian life and customs. Pop., 3000.

ANCONA, ä'n-kō'nà (the name alludes to its situation at the bend of the sea-coast; Gk. ἀγκών, *ankōn*, angle, corner). The capital of the province of Ancona, in central Italy, in the compartimento of the Marches, 132 miles, (185 by rail) northeast of Rome, lat. 43° 37' N. and long. 13° 31' E. It is an episcopal city, and, next to Venice, the most important Italian port on the Adriatic (Map: Italy, H 4). It is beautifully situated in the form of an amphitheatre between two promontories. The harbor has been greatly improved by the government in recent years and is now deep enough for large vessels. It is defended from naval attack by forts and from the violence of the sea by two moles. The ancient mole was built by Trajan and on it stands a triumphal arch of Parian marble designed by Apollodorus. The modern mole with the lighthouse was built by Clement XII and its triumphal arch was designed by Vanvitelli. The cathedral of St. Cyriac, built in the eleventh and twelfth centuries on the site of the temple of Venus mentioned by Catullus and Juvenal, contains 10 of its columns, with a very ancient dodecagonal dome. The town hall was built in the thirteenth century, restored in the fifteenth, and partially modernized in 1647. The museum contains many valuable antiquities and some valuable paintings. The principal industries are sugar refining, shipbuilding, and the manufacture of paper, sail cloth, and silk. The exports are small; the imports are salt fish, coffee, iron and steel, wheat, raw sugar, and coal. Regular steamship communication is maintained with the principal Mediterranean ports. The United States maintains there a consular agency.

Ancona is supposed to have been founded by Syracusans who had fled from the tyranny of Dionysius the Elder. It was destroyed by the Goths, rebuilt by Narses, and again destroyed by the Saracens in the tenth century. It afterward became a republic and was later annexed to the States of the Church. In 1798 it was taken by the French, who in 1799 surrendered it to the Russians and Austrians after a long and gallant defense. In 1832, when the Roman frontiers were in the possession of the Austrians, a French squadron appeared before the

harbor and landed 1500 men, who took possession of the town. It remained in their hands until 1838, when both French and Austrians retired from the Papal States. In 1849 a revolutionary garrison in Ancona capitulated after enduring a siege by the Austrians of 25 days. Pop., 1881, 48,000; 1901, 56,835; 1911, 63,100.

ANCONA, ALESSANDRO D' (1835—). A distinguished Italian critic, journalist, and professor at the University of Pisa. He was born in Pisa. During the days preceding the war of Italian independence he was active in politics, but after the peace of Villafranca he retired from political life, and for awhile edited the leading Florentine journal, *La Nazione*. In 1861 he was called to the chair of literature at the university in his native city. At the age of 18 he published a life and critical edition of the works of the Dominican philosopher, Tommaso Campanella. Among the many volumes which he has since produced, special mention should be made of *I precursori di Dante* (1874), *Origini del teatro in Italia* (1877), *La poesia popolare italiana* (1878); *Manuale della letteratura italiana* (1892-95).

ANCORA, än-kō'rà (It.). A former synonym of the French word *encore*, 'again,' and used in demanding the repetition of a song, for which the French now, however, use the word *bis*, 'twice.'

ANCRE, än'kr', CONCINO CONCINI, MARQUIS D' (?—1617). A Florentine adventurer, who went to the French court in 1600 with Maria de' Medici, Queen of Henry IV. With his wife, Leonora Galigai, he exercised an unhappy influence in promoting the disagreement between the King and Queen. When, after Henry's death, the Queen became regent, Concini, as her favorite, obtained possession of the reins of government and in 1613 was made a Marshal and Prime Minister. He bought the marquisate of Ancre, in Picardy, and took his title from it. Because of his rapacity he became an object of detestation equally to the nobility and the people. A conspiracy was formed against him, to which the young King, Louis XIII, was privy, and he was assassinated in April, 1617, on the bridge of the Louvre just as he was leaving it. Vitry, a captain of the royal bodyguard, accomplished the murder. His wife was soon afterward accused of witchcraft and was executed. Consult Bazin, *Histoire de France sous le règne de Louis XIII* (Paris, 1837-42).

ANCREN RIWLE, än'krën rōōl; *ME. pron.* än'krën rī'le (Rule of Anchoresses). An exposition of duties and rules of life, said to have been drawn up by Simon of Ghent, Bishop of Salisbury (1297), for a religious community of women at Tarrant-Kaines in Dorsetshire.

AN'CRUM MOOR. A moor in Scotland a little northwest of Jedburgh (q.v.). It was, in 1545, the scene of the defeat of 5000 English under Sir Ralph Evers and Sir Brian Latoun by a Scottish force under the Earl of Angus and Scott of Buccleuch. A defaced monument marks the spot where a Scottish maiden, named Lilliard, is said to have done prodigies of valor.

ANCUD, än-kōōd' (formerly San Carlos). Capital of the province of Chiloe, Chile (Map: Chile, C 12). It is situated on the north side of the island of Chiloe, which lies near the mainland, about 575 miles south from Valparaiso, with which it is connected by steamship line. It is about 4000 miles from Panama and has an excellent harbor, some manufactures and fish-

ing interests. It was much frequented as an anchorage in the days of Antarctic whale fishing. It was settled in 1768; was the last stronghold of the Spaniards in Chile during the war of the rebellion, surrendering to the revolutionists in 1826. Pop., 1905, town, 4000; municipality, 25,000.

AN'CUS MAR'CIUS (?-614 B.C.). According to Roman tradition, the son of Pompilia, daughter of King Numa Pompilius, and the fourth King of Rome. Following the example of Numa, he endeavored to restore the almost forgotten worship of the gods and the cultivation of the arts of peace among the Romans. But, despite his inclination for peace, he was engaged in several wars with the neighboring Latin tribes, whom he subdued and reduced to order. These Latins Niebuhr (q.v.) considers to have formed the original plebeians. Against the Etruscans he fortified the Janiculum, connected it with Rome by a wooden bridge, and gained possession of both banks of the Tiber as far as its mouth, where he founded Ostia as the port of Rome. He built the first Roman prison of which we read, a proof that civilization had really commenced, inasmuch as offenses then formally ceased to be regarded as private and personal matters and were treated as crimes against the community. A prison, said to be his, is still in existence near the Forum. He reigned 24 years. It is needless to add that the kings of Rome, as we know them, are not historical characters.

ANCY'RA. See ANGORA.

ANCZYC, än'chits, WLADYSLAW LUDWIK (1823-83). A Polish writer, born at Vilna. He studied pharmacy, but turned to literature, and wrote a number of popular Polish comedies, which are marked by keen characterization and forceful style. His works include *Bureaucracy* (1848), *The Peasant Aristocrats* (1851), *The Inhabitants of Lobsow* (1857), *The Raftsmen* (1875), *The Peasant Emigration* (1876). Of his poems, the narrative *The Tyrtouz* (1883) is perhaps the best known. His labors included also a libretto for the opera *Dutch Voyevoda*. Besides this and other original writing, he translated into Polish many German and French classics, including Victor Hugo's *Ruy Blas*. He edited one popular and one children's magazine, and, under the pseudonym of *Kazimierz Góralczyk*, a number of books for popular reading.

ANDALUSIA, än'dà-lōō'shī-à (Sp. *Andalucía* for Vandalsia, the Land of the Vandals). A region in the southern part of Spain, a part of the old Roman province of Bætica, which comprises the present provinces of Almería, Málaga, Cádiz, Huelva, Seville, Córdoba, and Jaén (Map: Spain, C 4). Its area is 33,697 square miles. The region is divided into Upper and Lower Andalusia. The former comprises the mountainous regions of the Sierra Morena on the north and the Sierra Nevada on the south, with the valley of the upper stream of the Guadalquivir. Lower Andalusia consists chiefly of the valley of both sides of the lower Guadalquivir. The lower regions have a very mild, almost African, climate. On the Atlantic coast the temperature is much lower, and in the highlands snow is not infrequent. The soil is very fertile, both in the mountain valleys of Upper Andalusia and in the deep valleys along the Guadalquivir, and the warm climate allows of the cultivation of many southern fruits. Oranges, lemons, palms, olives, and sugar are cultivated successfully,

while wheat, corn, and other grains ripen as early as April and yield abundant crops. The districts along the coast are generally unfruitful and in some cases utterly unfit for cultivation because of salt lakes and marshes. In ancient times the fertility of Andalusia was proverbial, as evidenced by the names applied to the region such as "granary," "wine cellar," and "gold purse" of Spain. Even at present Andalusia is one of the most fertile parts of Spain; nevertheless, famine conditions prevailed in 1905, and thousands were obliged to emigrate. Cattle-raising is highly developed, and Andalusian breeds of horses, mules, and bulls have long been famous. The people are graceful, and their attire picturesque. Their language is Spanish with a slight admixture of Arabic. Pop., Dec. 31, 1910, 3,828,916.

History. Andalusia, which was overrun by the Vandals in the early part of the fifth century, was probably the Tarshish of the Bible, its name in classical geography being Tartessus (a very ancient town near the mouth of the Guadalquivir having borne the name of Tartessus). From the Carthaginians, who established themselves there in the third century B.C., the country passed to the Romans, who called it Bætica, from the river Bætis (Guadalquivir). Under the Empire it attained great prosperity and assimilated rapidly the civilization of the Romans. The Vandals remained but a short time in the country and were succeeded by the Visigoths, who ruled Spain till the invasion of the Arabs, in 711. The name of Andalusia is inseparably connected with the glory of Saracen and Moorish civilization in mediæval Spain. Within its borders were situated Córdoba, Seville, Granada, and Jaén, the centres of Mohammedan culture, industry, and commerce. By contrast with the gloom and emptiness of the Dark Ages in northern Europe, history has cast almost a fairy light on the plains of "smiling" Andalusia, the home of learning and art, of chivalry and humane toleration. Córdoba was the Athens of the West, the seat of the arts and sciences; and later still, under the Spaniards even, "when the sun of Raphael set in Italy, painting here arose in a new form in the Velasquez, Murillo, and Cano schools of Seville, the finest in the Peninsula." The decadence of Andalusia set in with the downfall of the caliphate of Córdoba in the eleventh century and the disruption of Spanish Islam into a number of independent principalities. One by one the cities of Andalusia passed into the power of Castile. Granada alone and the surrounding *vega* held out for two centuries after Córdoba, Seville, and Cádiz had fallen. The noblest of the Moorish race, fleeing before the Christian advance, crowded into Granada, and the genius of an entire nation made its home within the walls of a city; the lustre which it shed over Granada, however, was but the hectic flush of the dying Moorish civilization. In 1492 Granada was taken by the forces of United Christian Spain. Consult Murray, *The Cities and Wilds of Andalusia* (London, 1853), and Laine, "Sur les routes d'Andalousie" in *La Nouvelle Revue*, No. 115 (Paris, 1898).

ANDALUSITE, *ãn'dà-lũ'sit* (discovered in Andalusia). An anhydrous aluminum silicate that crystallizes in the orthorhombic system, and is usually found in coarse, square, prismatic forms, white or light gray, green, violet, or red in color. A variety known as chiastolite

or macle, is characterized by dark-colored, organic inclusions, arranged symmetrically to the long axis of the crystal, and shows on a fracture a clearly marked cross or square figure. This variety has been found in several localities, as Lancaster and Sterling, Mass.

ANDAMANS, *ãn'dà-manz*. A chain of islands politically attached to British India, situated toward the east side of the Bay of Bengal, between 10° and 14° N. lat. and about 93° E. long., 680 miles south of the mouth of the Ganges (Map: Asia, J 7). The group covers an area of 2508 square miles, and consists of the Great and Little Andamans, divided by the Duncan passage. Three large islands, the North, Middle, and South, and several smaller ones constitute the Great Andamans; the chief of the Little Andamans are Interview, Outram, and Henry Lawrence. With the Nicobar Islands (q.v.), they form a province under a chief commissioner resident at Port Blair. Stewart Sound is the centre for commerce in lumber. Since 1858 the islands have been a penal settlement of India. Except where clearings have been made, the surface is densely covered with forests yielding valuable timber. Of this about 160 square miles is under reserve. Hemp, coconuts, aloes, tea, potatoes, and artichokes are the chief agricultural products, and the cultivation of cacao, indigo, and coffee has been successfully introduced. Port Blair (pop., 1912, 15,600) on the east side of South Island, and Port Cornwallis, on the same side of North Island, have two fine natural harbors. The principal islands have monthly steamboat communication with Calcutta.

Ethnography. The Andamanese, also called Mincopies, are a physically uniform Negrito race, whose stature, however, has a wider range than is generally thought. Their head form tends to be brachycephalic, suggesting relationship with some of the natives of the Nicobar Islands to the south, and with broad-headed Negritos elsewhere. Giuffrida-Ruggeri (1913), the latest anthropological classifier, makes the Andamanese a subdivision of the Asiatic variety of his *Homo sapiens pigmæus* (one of the great divisions of mankind, as one species). Their language, which has several dialects, seems to be unrelated to any other tongue. Their culture is very primitive, but their weapons and industrial and art products show that they have not neglected their environment. They have also, though known only to some of the older members of the more secluded communities, a mythology, with characteristic folk-lore tales. The intelligence of these people has been underestimated. The census of 1901 gives the aborigines as 1882, of whom 842 were females, divided into 12 small tribes. Lying in the route of the Arabs eastward and of the Malays westward, these islands bear traces of the influence of both, and since the establishment of the British penal colony, there is growing up a very mixed race of hybrids. The Andamanese have inhabited their territory since prehistoric times. Flower (1879) and Keane (1896) both hold that they represent a primitive or generalized type, from which, on the one hand, the African negroes, and on the other the Melanesians, may have proceeded. (See NEGRITOS.) The population of the Andamans, with the Nicobars, in 1911, was 26,459. A large part of these are convicts who are employed in reclaiming land and erecting government buildings. The Andamans are mentioned

by Arabic geographers of the ninth century, by Marco Polo in the thirteenth, and Conti in the fifteenth, who gives the signification of the name as 'Gold Islands.' Hopetown, on Viper Island, was the scene of the assassination by a Mohammedan convict of Earl Mayo, Governor-General of India, while on an official tour of inspection in 1872. Consult: Man, *The Aborigines of the Andaman Islands* (London, 1885), and "The Andaman Islands," in *The Indian Antiquary* (vols. xxviii and xxx, Bombay, 1899 and 1900); also Kloss, *In the Andamans and Nicobars* (1903) and the works of Portman, including his *Notes on the Languages of the South Andaman Group* (Calcutta, 1898).

ANDANTE, ăn-dăn'tă (It. going, moving, from *andare*, to walk, go). In music, one of the five principal tempos. It implies a somewhat slow and gentle movement, intermediate between *adagio* (than which it is faster) and *allegro* (than which it is slower). Originally it denoted a moderately animated time, and in works of masters of the eighteenth century it is to be interpreted in this sense. In certain phrases the older meaning still holds to-day. Thus, *poco andante* means 'somewhat animated,' *più andante* 'faster,' *meno andante* 'slower.' *Andantino*, a diminutive of *andante*, bears the same relation to the primitive word as *adagietto* to *adagio*. *Andante* also means the slow movement or section of a musical composition.

ANDANTINO. See **ANDANTE**.

ANDAQUI, ăn-dă'kê. An important Indian confederacy formerly holding the head-streams of the Caquetá and Magdalena rivers and the adjoining mountain region in southern Colombia. Before the period of the Spanish conquest the tribes had attained some degree of civilization, attested by the ruins of temples and other edifices, with gigantic statues carved from the living rock yet to be seen in their ancient territory. A wild and warlike remnant survives in the inaccessible fastnesses at the head of Fragua River, still guarding, according to a local legend, a cavern in which are piled up the golden treasures of their ancestors. The language shows some similarities to the Chibcha, but appears to constitute a distinct stock, the Andaquian. See an account of the Andaqui and their language in *Bull. Amer. Ethnol. Soc.*, vol. i, pp. 53-72 (New York, 1860-61).

ANDAS'TEE. See **CONESTOGA**.

ANDELYS, LES, ăn'zăn'd'lê'. A town in the department of Eure, France, 20 miles northeast of Evreux, on the right bank of the Seine (Map: France, N., G 3). It consists of Grand and Petit Andelys. The former dates from the sixth century and contains the fine collegiate church of Notre Dame, built from the thirteenth to the sixteenth centuries, noted for its superb stained-glass windows and valuable paintings. Petit Andelys clusters around the famous Norman castle of Gaillard, built by Richard Cœur de Lion in 1195, to command the navigation of the Seine and act as a stronghold for Normandy against the French monarchs. Trade is in cloth and grain, and there are manufactures of thread and leather. Pop., 1901, 4539; 1906, 5514; 1911, 5530.

ANDENNE, ăn'dên'. A town of Belgium, in the province of Namur, on the right bank of the Meuse, 10 miles by rail east of Namur (Map: Belgium, D 4). It has manufactures of paper, porcelain, and tobacco pipes, the latter being its most famous product. There are beds of

pipe-clay, quarries of marble, and lead, iron, and coal mines in the neighborhood. Pop., 1900, 7711; 1910, 7803.

ANDER, ăn'dêr, ALOYS (1817-64). A famous Austrian tenor, born at Liebititz, Bohemia. He appeared at Vienna in 1845 and was first to sing there the rôle of John of Leyden in Meyerbeer's *Le Prophète*. His voice was not strong, but was of excellent quality.

ANDERAB, ăn'dêr-ăb', or **INDERAB**, ăn'dêr-ăb'. A town of Afghanistan, on the northern slope of the Hindu-Kush Mountains and on the north bank of the Anderab, or Inderab, River, 85 miles north of Kabul (Map: Afghanistan, L 3). It is surrounded by gardens, orchards, and vineyards and is an important post in the commerce between Persia and India. Pop., estimated at 6000.

ANDERLECHT, ăn'dêr-lêkt. A manufacturing suburb of Brussels, Belgium (Map: Belgium, C 4). It has numerous manufacturing establishments, consisting mostly of spinning and weaving mills, dyeing works, and breweries. Pop., 1890, 32,300; 1910, 63,328.

ANDERLEDY, ăn'dêr-lă'dê, ANTONIUS MARIA (1819-92). A general of the Jesuits, born at Brieg (Valais), Switzerland. He entered the order of Jesuits in 1838, and studied philosophy and theology at Rome and Freiburg. In 1848 he came to the United States, where he was pastor at Green Bay, Wis., and in 1851 returned to Germany, where, until 1853, he directed Jesuit missions. From 1853 to 1856 he was rector of the Jesuit seminary at Cologne. In 1856 he was appointed rector of the seminary at Paderborn, and in 1865 assumed the professorship of moral theology at the Seminary of Maria-Laach, of which he was made rector in 1869. He was appointed, in 1870, assistant to J. P. Beckx, general of the Jesuits, whom he succeeded in 1887.

ANDERMATT, ăn'dêr-măt, or **URSEREN** (the Italian Orsera). The chief town of the Urseren valley, in the canton of Uri, Switzerland, 4 miles south of Göschenen (Map: Switzerland, C 2). It is 4738 feet above sea level and is well fortified, for it is at the intersection of three of the most important Alpine highways, the road through the St. Gotthard Pass, that to the Rhone valley, and the upper Alps road going toward the valley of the Rhine. The St. Gotthard Tunnel passes underneath the valley. The town has an active transit trade and is a summer resort and a centre for winter sports. Pop., 994.

ANDERNACH, ăn'dêr-näg. An ancient town in the Prussian Rhine province, situated on the left bank of the Rhine, about 10 miles northwest of Coblenz and near the mouth of the Nette. The town has manufactures of chemicals, perfumeries, cigars, millstones, exported to distant parts of the world, and *tuffstein*, or trass, an indurated volcanic mud, which, when pulverized and mixed with lime, makes a mortar or cement for constructions under water, and which is used largely in the construction of dikes and sea walls. There is also trade in wine and grain. Pop., in 1890, about 6000; in 1905, 8802. Andernach was the Antunnacum of antiquity, one of the fifty forts of Drusus. Parts of the old walls remain and preserve its mediæval appearance to some extent. The parish church of St. Genoveva, with four towers, one of which dates back to the Carolingian period, and ruins of the old castle of the archbishops of Cologne, are

interesting. After a restoration the Rhein-Tor was gutted by fire in 1907. Late in the fifteenth century Andernach was captured by the Electorate of Saxony. The French burned it in 1688.

ANDERSEN, ä'n'dër-sen, HANS CHRISTIAN (1805-75). A celebrated Danish writer styled the "children's poet," whose best poetry is his prose. He was born at Odense, Denmark, April 2, 1805. The child of poor and shiftless parents, he had little instruction and few associates, but his dramatic instinct was stimulated by La Fontaine and the *Arabian Nights* and a visit of a theatrical company to Odense, in 1818, led him to seek his dramatic fortune in Copenhagen (1819), where for four years he worked diligently, but produced nothing of note. He gained a scholarship, however, and friends, who in 1829 enabled him to publish *A Journey on Foot from Holm Canal to the East Point of Amager*, an arabesque naïvely plagiarized and parodied from the German romanticists. *Fantasies and Sketches*, sentimental and rather mawkish poems, followed in 1831, after which he made a tour of Germany, the first of many wanderings. This inspired *Silhouettes*, a book with admirable pages of description. In 1835 he essayed the *Fairy Tales*, by which he was to achieve world-wide recognition. The classic *Tinderbox* and *Big Claus and Little Claus* are also of this year. He was, however, disposed to underrate his "sleight of hand with fancy's golden apples," devoting himself to novels, *The Improvisatore* (1835), *O. T.* (1836), and *Only a Fiddler* (1837), which gave him a European reputation for picturesque description, humor, and pathos of the romantic type. In the last, there are interesting autobiographical touches; but there is no clear character-drawing in any of them, and this lack made his repeated dramatic essays uniform failures. He was still to write delightful impressions of travel, as in *A Poet's Bazaar* (1842), *In Sweden* (1849), and *In Spain* (1863). He wrote other novels, *The Two Baronesses* (1849) and *To Be or Not To Be* (1857), and an epic failure, *Ahasuerus* (1847); but the *Picture Book Without Pictures* (1840) had revealed his best talent to him as an interpreter of child nature. Between 1852 and 1862 he printed nine small volumes of stories and finished the last of them in 1872. His last years were unharassed by criticism and attended by all the honor and love that should accompany old age. His literary jubilee occurred in 1869, and he died at Copenhagen, Aug. 4, 1875, after a brief and painless illness.

In appearance, Andersen was limp and very ungainly. His nose was large, his neck and limbs long and lank, and his hands and feet very large; yet he fancied himself distinguished looking and had a child's delight in dress and decoration. His character, too, hovered between the child-like and the childish. He never realized the limitations of his genius. Curiously enough, he did not like children, and he was not personally attractive to them. He was a shrewd observer, but self-absorbed and out of touch with his political generation. His literary style is faulty, but it reflects marvelously the vivid imagery of juvenile fancy. He had at his finger-tips all the venerable devices of the nursery to spur attention and kindle sympathy. No writer looks at nature so wholly with the child's eyes as he, none so interpenetrates narration with the smiles, the fears, and the very intonations of childhood. His personifications

may tease the adult fancy, but they are the natural drama of children. Andersen's works are Englished in ten uniform but unnumbered volumes. Mary Howitt's is still the best of many translations of the *Tales*, though it is far from faultless. A sumptuous centenary edition of the *Tales* appeared (1900) under the patronage of the Danish government simultaneously in six languages. Andersen's *Autobiography* was compiled by Jonas (Berlin, 1879). R. Nisbet Bain's *Life of Andersen* (New York, 1895) is the best in English.

ANDERSEN, ä'n'dër-sen, KARL (1828-83). A Danish poet. He was born at Copenhagen, studied law there, and was subsequently appointed curator of the royal museums at the castle of Rosenborg. He first became known through his *En Krands paa en Arbejders Kiste* ('A Wreath for a Laborer's Coffin,' 1857). He also published *Lyriske Smaadigte* ('Shorter Lyrics,' 1863), *Poesier* ('Poems,' 1870), *Genrebilleder* ('Genre-Pictures,' 1876-81), and other works. He made a collection of Icelandic sagas (1864) and translations of Servian folk-songs.

ANDERSON. A city and railroad centre, the county-seat of Madison Co., Ind., 36 miles northeast of Indianapolis, on the Central Indiana, the Cleveland, Cincinnati, Chicago, and St. Louis, and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads, and on the east fork of the White River (Map: Indiana, D 2). An abundant supply of natural gas promotes the manufacturing industries, which include automobiles, silos, bottles, magnetos, files, tile, cheese-cutters, electric and gasoline motors, pumps, paper boxes, steel and wire nails, mattresses, street cars, etc. The city is the centre of an extensive system of interurban electric railways, the power for the operation of which is supplied by a million-dollar plant. Anderson is the seat of an industrial school and has a Carnegie library and a fine high school building. Near the city are interesting mounds of the so-called "mound-builders." Anderson was settled in 1823, was incorporated in 1865, and is governed under the charter of 1865, which provides for a mayor, elected every four years, and a city council of six members, controlling all appointments. The city owns and operates the water works and electric light plant. Its growth has been very rapid. Pop., 1880, 4126; 1890, 10,741; 1900, 20,178; 1910, 22,476; 1913 (est.), 25,000.

ANDERSON. A city and the county-seat of Anderson Co., S. C., about 100 miles (direct) northwest of the State capital, on the Blue Ridge and the Charleston and Western Carolina railroads (Map: South Carolina, B 2). It has city and school libraries, three splendid school buildings and churches, a fine city hall, hospital, and county court house. The city is in a fertile cotton-growing and agricultural region and has several large wholesale stores. Among its industrial establishments are cotton and cottonseed oil mills, employing 4900 persons, factories for the manufacture of fertilizers, spring beds and mattresses, overalls, collars, and other articles of apparel, lumber and flour mills, and machine shops. A notable feature of the city is a superb electric power station, 10 miles distant on the Seneca River, controlled by a private corporation. The government, under a charter of 1882, is administered by a mayor, elected every two years, and a municipal council. Town meetings are held when neces-

sary. Anderson was settled in 1827 and is the birthplace of John C. Calhoun. A large part of the population lives outside the city limits, which are restricted to one mile. For two decades Anderson has been the most rapidly growing city in South Carolina, and the county ranks second in the United States in the production of cotton. Pop., 1890, 3018; 1900, 5498; 1910, 9654; 1913 (est.), 17,861.

ANDERSON, ALEXANDER (1775-1870). The earliest wood engraver in the United States, also a line engraver. He was born in New York City, the son of a printer, and as a schoolboy his favorite occupation was copying engravings. At 12 he improvised his own copper plate, upon which he drew with a graver made from a pocket knife. In 1789, at his father's wish, he began the study of medicine. He first saw wood engravings by Bewick (q.v.) in 1793 and immediately made trial of boxwood blocks, which were henceforth his favorite medium. The following year he illustrated in this technique the *Looking Glass for Men* for the publisher Durrell. In 1795 he was licensed to practice medicine, and although he was highly successful, he retired from practice in 1798, after the death of his wife, parents, infant son, and brother from yellow fever. During the years following he illustrated many works, chiefly after English originals; such as Bewick's *Quadrupeds* (1810), on the whole an excellent copy; Holbein's *Dance of Death*, published under the title of *Emblems of Mortality* (1810), and *Shakespeare's Plays*, illustrated after Thomson (1812). From 1820 he devoted himself exclusively to wood engraving. The best of all his productions are two fine and spirited cuts, the "Return from the Boar Hunt" after Ridinger, and Teniers's "Water Fowl," both published in 1818. Unfortunately there was no demand for work of such size and excellence by American publishers. He was elected honorary member of the National Academy of Design in 1843, and died, Jan. 17, 1870, at Jersey City.

Anderson was in the truest sense a pioneer; he is the "father of wood engraving" in the United States. Entirely self-taught, he modeled his art upon that of Bewick, whom he approaches only in his very best work. Considering the difficulties surmounted, his achievements are indeed remarkable; but he was constantly handicapped by the poor and cheap character of the illustrations demanded by the American book trade of his day. The volume of his work is enormous. Consult: Lossing, *Memorial Address on Alexander Anderson*, published by the New York Historical Society (1872); *Early American Wood Engravings by Alexander Anderson and Others* (New York, 1877); F. M. Burr, *Life and Works of Alexander Anderson* (New York, 1893); Linton, "The History of American Engraving," in *American Art Annual*, vol. i, part i.

ANDERSON, Sir EDMUND (1530-1605). An English jurist, Chief Justice of the Court of Common Pleas in 1582, distinguished for zeal in the cause of the Established Church, and notorious for harshness toward Catholics and other dissenters. In his attitude at the trials of Robert Brown, the founder of the Brownists, and of John Udall, concerned in the authorship of the Martin Marprelate pamphlets, he showed a spirit of brutal vindictiveness bent on conviction. He was one of the commissioners in 1586 to try Queen Mary of Scotland and after-

ward to try Sir Walter Raleigh. He was a man of extraordinary legal learning.

ANDERSON, EDWIN HATFIELD (1861—). An American librarian, who was born in Zionsville, Ind., and graduated from Wabash College in 1883. After spending a year at the New York State Library School at Albany, he was, in 1885, cataloguer at the Newberry Library in Chicago; from 1892 to 1895 librarian of the Carnegie Free Library at Braddock, Pa.; and for the next decade librarian of the Carnegie Free Library at Pittsburgh, which he had organized. Temporarily he abandoned library work to engage in zinc and lead mining in Missouri, returning to his earlier vocation in 1906 as director of the New York State Library and Library School. After a five years' service in this office he was chosen assistant director, and, on the death in 1913 of John S. Billings (q.v.), director, of the New York Public Library. In 1901-02 Mr. Anderson was president of the Keystone State Library Association and in 1903-04 was a member of the Pennsylvania Public Records Commission. He was president of the New York Library Association in 1908.

ANDERSON, ELIZABETH GARRETT (Mrs.) (1836—). An English physician and pioneer of woman's rights, born in Suffolk. In spite of hostile public opinion and the opposition of the medical schools, she began the study of medicine in 1860. After a course of private instruction, she was repeatedly refused admission to examinations by the Royal College of Physicians and many other bodies, so that it seemed as if she would not be able to gain the necessary diploma permitting her to practice medicine. In 1865, however, she obtained the license of the Society of Apothecaries, and in the following year was made general medical assistant in St. Mary's Dispensary in London, an institution which later developed into the New Hospital for women. She passed the medical examinations of the University of Paris and received the degree of M.D. in 1870. She was senior physician of the New Hospital in 1866-90, dean of the London School of Medicine for Women in 1883-1903, and president of the East Anglian branch of the British Medical Association in 1896-97. Mrs. Anderson was the first woman in England to be honored with the office of mayor, having been elected in 1908 head of the city government of Aldeburgh.

ANDERSON, GALUSHA (1832—). An American theologian. He was born at North Bergen, N. Y., and was educated at the University of Rochester and the Rochester (Baptist) Theological Seminary. He held several pastorates, became president successively of the universities of Chicago (1878-85) and Denison, Ohio (1887-90), professor of practical theology at Chicago in 1892-1903, when he became emeritus professor. His writings include: *The Elements of Chrysostom's Power as a Preacher* (1903); *Ancient Sermons for Modern Times*, a translation from Asterius (1904); *When Neighbors Were Neighbors, a Story of Love and Life in Olden Days* (1911).

ANDERSON, GEORGE B. (1831-62). A Confederate soldier. He was born at Wilmington, N. C., graduated at West Point in 1852, and in 1855 was appointed first lieutenant, serving as regimental adjutant after 1858. He resigned in 1861 to enter the Confederate service and soon became a brigadier-general and was placed in general command of the North Carolina coast

defenses. While leading a brigade at the battle of Antietam (Sept. 17, 1862), he was fatally wounded, and died on October 16.

ANDERSON, JAMES, LL.D. (1739–1808). A Scotch writer on political economy and agriculture. He was born at the village of Hermiston, near Edinburgh, and lost both his parents when very young, so that the management of a large farm, which had been in the possession of the family for a long time, devolved upon him. Recognizing the practical importance of a knowledge of chemistry to a farmer, he attended the chemistry class in the University of Edinburgh and brought the results of his study to bear on his profession. He invented, at an early period of life, the small two-horse plow without wheels, commonly called the Scotch plow, which is generally admitted to have been one of the most useful improvements in agricultural implements ever introduced. In 1780 the University of Aberdeen bestowed on him the degree of doctor of laws. In 1784, on account of his pamphlet, entitled *Encouragement of the National Fisheries*, he was engaged by the government to make a survey of the western coast of Scotland, with special reference to that object. He next began, in 1791, the publication of a periodical called *The Bee*, which was continued for three years. In 1797 he went to London, where he pursued his literary occupations with such intense assiduity that his health gradually gave way. He died on Oct. 15, 1808. In his essay entitled *An Inquiry into the Nature of the Corn Laws, with a View of the Corn Bill Proposed for Scotland* (1777), Anderson anticipates the doctrine of rent later identified with the work of Ricardo. His other writings include: *Observations on the Means of Inciting a Spirit of National Industry* (1777); *An Account of the Present State of the Hebrides* (1785); *Observations on Slavery* (1789); *Recreations in Agriculture, Natural History, Arts, and Miscellaneous Literature* (6 vols., 1799–1802).

ANDERSON, Sir JAMES (1824–93). A Scotch navigator. He was born at Dumfries and in 1851 entered the service of the Cunard Company. He commanded successively four vessels of that line and so distinguished himself by his excellent judgment and high skill that, in 1865, he was selected to command the *Great Eastern* when it was chartered to lay the Atlantic cable (see ATLANTIC TELEGRAPH), and thenceforth his name became intimately associated with that vessel.

ANDERSON, JOHN, F.R.S. (1726–96). A Scotch professor of natural philosophy in the University of Glasgow, and founder of Anderson's College (now merged in the Glasgow and West of Scotland Technical College). He was born in the parish of Roseneath, Dunbartonshire. He studied at the University of Glasgow, in which, in his thirtieth year, he was appointed professor of Oriental languages. Four years later (1760) he was transferred to the chair of natural philosophy. He was greatly interested in the practical application of science, and in a spirit of philanthropy he instituted a lecture course for artisans, in addition to his usual lectures, which were erudite and technical. He continued these twice every week during the session to the end of his life. His valuable work, entitled *Institutes of Physics*, appeared in 1786. Shortly before the French Revolution he invented a form of gun whose recoil was stopped by the condensation of air within the body of

the carriage; but, after having endeavored in vain to attract the attention of the British government to it, he proceeded to Paris in 1791 and, being a sympathizer with the Revolution, presented his model to the National Convention. It was hung up in their hall with the following inscription over it: "The gift of SCIENCE to LIBERTY." Afterward, when the allied forces had drawn a military cordon around the frontiers of France to prevent the introduction of French newspapers into Germany, Anderson ingeniously suggested the expedient, which was adopted and proved quite successful, of making small balloons of paper, to which newspapers and manifestoes were tied, and letting them off, when the wind was favorable, for Germany. By his will he directed that the whole of his effects, of every kind, should be devoted to the establishment of an educational institution in Glasgow to be known as Anderson's University.

ANDERSON, JOHN (1833–1900). A Scotch scientist, born at Edinburgh. He studied at Edinburgh University and from 1864 to 1886 was professor of comparative anatomy at the Calcutta Medical College and curator of the government museum. As scientific officer, he accompanied expeditions to western China in 1868–69 and in 1874–75. In 1881 he was commissioned to make an investigation of the marine animals of the Mergui archipelago. He was a fellow of the Royal Society and a contributor to scientific journals and published *Mandelay to Momen* (1875), *Anatomical and Zoölogical Researches* (1878), *Two Expeditions to Western China* (1876), *Fauna of Mergui and its Archipelago* (1889), and *Herpetology of Arabia, with a Preliminary List of the Reptiles and Batrachians of Egypt* (1896). His observations in the Mergui archipelago appeared in vols. xxi and xxii of the *Journal* of the Linnæan Society.

ANDERSON, JOHN FISHER (1873—). An American physician and bacteriologist, born in Fredericksburg, Va., and educated in the public schools of that and other cities. Having studied medicine at the University of Virginia and taken his degree in 1896, he was appointed passed assistant surgeon in the United States Public Health and Marine Hospital Service, being assigned in the same year (1898) on epidemic duty in connection with yellow fever. He was quarantine officer in the Dry Tortugas (1898–99); sanitary observer at Glasgow, Oporto, and Liverpool (1899–1900); and sanitary attaché at the United States consulates at Barcelona, Marseilles, and other European cities (1900–01). During his service abroad he carried on studies at the Thompson-Yates Laboratory and the School of Tropical Medicine in Liverpool and at the Patologische Institut in Vienna. In 1902 he was appointed assistant director of the Hygienic Laboratory at Washington and in 1909 director. In 1913 he was in immediate charge of the government investigation into the sensational claims of Dr. F. F. Friedmann to the discovery in a "turtle serum" of an absolute cure for tuberculosis. He wrote many articles and bulletins showing the results of original investigations upon the effects of serums, toxins, and anti-toxins; typhoid fever bacteria in mills; tubercle bacilli, etc. In 1912 he collaborated with T. B. McClintic on *A Method of Standardizing Disinfectants*.

ANDERSON, JOHN JACOB (1821–1906). An American author. He was born in New York City and graduated at its Normal School. For

30 years he was attached to, and for 20 years was principal of, a large grammar school in New York. He wrote many text-books of history, including *Pictorial School History of the United States* (1863), *A School History of England* (1870), *Manual of General History* (1867), *Complete Course in History* (1881), *A History of France* (1877), and *A History of the State of New York* (1902).

ANDERSON, LARZ (1866—). An American diplomat, born in Paris, France. He graduated at Harvard in 1888. After traveling for two years he was second secretary of the United States legation in London (1891-93), and first secretary of the United States embassy in Rome (1893-97). During the Spanish-American War he served as adjutant-general of United States Volunteers. He was Minister to Belgium (1911) and Ambassador to Japan (1912 to March, 1913).

ANDERSON, MARTIN BREWER (1815-90). An American preacher and educator, born at Brunswick, Me. Graduating at Waterville College (now Colby University) in 1840, he was for two years tutor of Latin, Greek, and mathematics, and for seven years professor of rhetoric and lecturer on modern history, at his alma mater. In 1850 he became editor of the New York *Recorder* (later the *Examiner*), a weekly Baptist paper. Called in 1853 to be the first president of the University of Rochester, he remained in this office for 35 years, until failing health compelled his resignation. A few years after the Civil War Dr. Anderson was urged to accept the presidency of Brown University. This highest honor which his denomination could confer upon him he was induced to decline because of the great need at Rochester. A vigorous and popular preacher, though never ordained to the ministry, Dr. Anderson was chosen president of the American Baptist Home Missionary Society in 1864 and of the Missionary Union in 1869. For 37 years he was a trustee of Vassar College and for 13 years a member of the New York board of charities. Selections from his numerous *Papers and Addresses* were published in two volumes in 1895, Wm. C. Morey, ed. Consult Asahel C. Kendrick, *Martin B. Anderson* (Philadelphia, 1895).

ANDERSON, MARY ANTOINETTE (1859—). An American actress, born at Sacramento, Cal. Her father, General Anderson, was killed in the Civil War, while serving on the Confederate side. Her mother married Dr. Hamilton Griffin and removed with him to Louisville, Ky. She was educated at the Ursuline Convent and the Academy of the Presentation Nuns in Louisville, and at the age of 13 began to study for the stage under Charlotte Cushman. She made her debut in the character of Juliet at Louisville, Nov. 27, 1875, with success. In 1876 she traveled through the West, and in the season of 1877-78 appeared in Philadelphia, New York, and Boston. In 1884-85 she played at the Lyceum Theatre, London, and in the character of Rosalind, in *As You Like It*, opened the Memorial Theatre at Stratford-on-Avon. From 1885 to 1889 she played in Great Britain, her chief parts being Juliet, Bianca in *Fazio*, Julia in *The Hunchback*; Evadne, Meg Merrilies, Pauline, Galatea, Clarice, in *Comedy and Tragedy*; Parthenia, Rosalind, and Perdita in *A Winter's Tale*, in which she achieved her greatest success. Illness in 1889 compelled her to retire from the stage. In 1890 she married Antonio Navarro de Viana, of New

York, and soon decided not to return to the stage. Consult Mary Anderson's Autobiography, *A Few Memories* (1896), and William Winter, *Stage Life of Mary Anderson* (1886).

ANDERSON, MELVILLE BEST (1851—). An American educator, born in Kalamazoo, Mich. He was educated at Cornell, Göttingen, and Butler universities, and became a professor in the last-named institution in 1877. During the years 1880-91 he held professorships successively at Knox College, Purdue University, and the State University of Iowa. He then accepted the chair of English literature in Leland Stanford, Jr., University and occupied it until 1910, when he was made professor emeritus. For 10 years he was engaged in making a triple-rime translation of Dante's *Divine Comedy*, and also at various times translated and edited a number of French works. In addition, he edited a volume of Bacon's *Essays* (1890) and wrote *Some Representative Poets of the Nineteenth Century* (1896) and *The Happy Teacher* (1910).

ANDERSON, RASMUS BJÖRN, LL.D. (1846—). An American scholar, author, and editor. He was born at Albion, Wis. In 1866 he received an M.A. from Luther College (Decorah, Iowa), and in 1888 an honorary LL.D. from the University of Wisconsin, where from 1875 to 1883 he was professor of Scandinavian languages and literature. From 1885 to 1889 he was United States Minister to Denmark. In 1898 he became editor at Madison, Wis., of *Amerika*, a Norwegian journal. His publications include: *The Scandinavian Languages* (1873); *America Not Discovered by Columbus* (1874); *Viking Tales of the North* (1877); *Norge i billeder* (1899); *Norse Mythology* (1901); *Bygdejevning* (1903), and translations of Brandes's *Eminent Authors in the Nineteenth Century*, and of the works of Björnson (7 vols.).

ANDERSON, RICHARD HENRY (1821-79). A Confederate soldier. He was born in South Carolina, graduated from West Point in 1842, and served as second lieutenant in the Mexican War. He took part in the southern line of operations and became first lieutenant in 1848 and captain in 1855. He resigned from the regular army (May, 1861), became a Confederate brigadier, assisted in the bombardment of Fort Sumter, and served with great gallantry throughout the war, distinguishing himself especially at Fair Oaks, Gaines's Mill, Frazier's Farm, Bull Run, and Gettysburg, where he commanded a division. He rose to the rank of major-general (August, 1862) and of lieutenant-general (May, 1864). In the final campaign he commanded the fourth corps of General Lee's army.

ANDERSON, ROBERT (1750-1830). A Scotch editor and biographer of the English poets. He was born at Carnwath, Lanarkshire; studied theology and afterward medicine in the University of Edinburgh, and became a physician, but soon after his marriage ceased practicing and from that time devoted himself to literature. His most important work was the compilation of *A Complete Edition of the Poets of Great Britain with Prefaces Biographical and Critical* (14 vols., 1792-1807). He edited the *Edinburgh Magazine* and in that capacity became the friend of many young writers, notably Thomas Campbell, who dedicated his first volume of verses to him. Consult Beattie, *Life and Letters of Campbell* (1849); *Poetical Works of Robert Anderson with the Life of the Author by Himself* (1820).

ANDERSON, ROBERT (1805-71). An American soldier. He was born near Louisville, Ky., graduated at West Point in 1825, and served in the Black Hawk War of 1832 as colonel of the Illinois volunteers. At this time Abraham Lincoln was twice mustered out of service and in by him when acting as assistant inspector-general. He was instructor of artillery practice at West Point, 1835-37; served in the second Seminole War, 1837-38, and in 1838 was brevetted captain and became assistant adjutant-general on General Scott's staff. He took part in the Mexican War and was severely wounded at Molino del Rey. In November, 1860, he took command in Charleston harbor, and was for 15 weeks confined to Fort Sumter by the Confederates. On April 14, after a bombardment of 36 hours, he was compelled to evacuate the fort. (See FORT SUMTER.) He was appointed brigadier-general in the United States army in May, 1861, and sent to command the Department of Kentucky, and then the Department of the Cumberland; but, owing to the failure of his health, he was relieved from active duty in October, 1861, and was retired from the service in October, 1863. In 1865 he was brevetted major-general. He translated and adapted from the French *Instructions for Field Artillery* (1840) and *Evolutions of Field Batteries* (1860). His *Reminiscences of the Black Hawk War* are included in the *Collections of the Wisconsin Historical Society* (1883-85), and his letters, under the title, *An Artillery Officer in the Mexican War, 1846-47*, were published in 1911 in New York. Consult Eba Anderson Lawton, *Major Robert Anderson and Fort Sumter, 1861* (New York, 1911).

ANDERSON, RUFUS, D.D., LL.D. (1796-1880). Secretary of the American Board of Commissioners for Foreign Missions. He was graduated at Bowdoin College (1818) and Andover Theological Seminary (1822), and after acting as assistant (1822-32), became full secretary, and so continued until 1866, when he retired. He was lecturer on Foreign Missions in Andover Theological Seminary 1867-69. He was one of the great missionary secretaries and historian of the American Board (3 vols., 1872-74). He inspected the Board's stations and has left the memorial in his *Observations upon the Peloponnesus and Greek Islands* (1830), *A Heathen Nation (the Hawaiians) Civilized* (1870), and in the history mentioned above. He died in Boston, May 30, 1880.

AN'DERSONVILLE. A village in Sumter Co., Ga., 62 miles south of Macon, notable as the site of a Confederate military prison during the Civil War (Map: Georgia, D 3). When established in November, 1863, the prison was an unsheltered inclosure occupying about 22 acres and crossed by a small stream about 5 feet wide and 1 foot deep. Subsequently the area was increased to about 27 acres, though a part of this was rendered unavailable by the establishment of a "dead line," the crossing of which by a prisoner meant immediate death. Into this area sometimes as many as 33,000 Federal soldiers were crowded, forced for the most part to live without shelter, fully exposed to the heat of summer, the frosts of winter, and the frequent storms, while they suffered terribly from the effects of insufficient and improper food. Amid surroundings of indescribable filth, they died by thousands, of diarrhœa, scurvy, dysentery, and fevers. The first

prisoners arrived on Feb. 15, 1864, and the last in April, 1865, the total amounting to 49,485, of whom more than 12,800, or 26 per cent, died in confinement. In the autumn of 1864 many of the prisoners were removed to Millen, Ga., and Florence, S. C., where the conditions were much less severe. A Confederate medical commission, composed of Dr. G. S. Hopkins and Surgeon H. E. Watkins, reported in 1864 that the abnormal death rate was due (1) to "the large number of prisoners crowded together," (2) to "the entire absence of all vegetables as diet, so necessary as a preventive to scurvy," (3) to "the want of barracks to shelter the prisoners from sun and rain," (4) to "the inadequate supply of wood and good water," (5) to "badly cooked food," (6) to "the filthy condition of the prisoners and prison generally," and (7) to "the morbid emanations from the branch, or ravine passing through the prison, the condition of which cannot be better explained than by naming it a morass of human excrement and mud." The post was in command of Gen. W. S. Winder, while Henry Wirz, a Swiss, was the prison superintendent. The latter was convicted by a special military court, in session from August to October, 1865, of "maliciously, willfully, and traitorously conspiring to injure the health and destroy the lives" of Union soldiers at Andersonville, and of "murder in violation of the laws of war," and on November 10 was hanged. Subsequently, the tract of land where the bodies had been hastily buried was turned into a national cemetery. Of the graves, 12,789 have been identified and marked with tablets, while 921 remain unknown. Consult Chipman, *The Horrors of Andersonville Rebel Prison* (San Francisco, 1891); Spencer, *A Narrative of Andersonville* (New York, 1866), and Stevenson, *The Southern Side, or Andersonville Prison* (Baltimore, 1876). Partisan accounts are numerous. For an impartial one see Rhodes, *History of the United States*, vol. v (New York, 1904).

ANDERSSON, ä'n'dër-sen, ADOLF (1818-79). A famous German chess-player, born in Breslau. He studied philosophy and mathematics at Breslau and taught at the Friedrichs-Gymnasium there. In 1851 he defeated Staunton at London. In 1858 he lost to Morphy, at Paris. He won two first prizes in the World's Tournament at London in 1862, and was victorious at Baden-Baden in 1870. He was noted for the brilliancy of his style of play. His *Sixty Chess Problems* is full of deep and ingenious combinations. He also wrote several papers on the theory of chess. Consult Bachmann, *Adolf Anderssen* (Ausbach, 1902).

ANDERSSON, ä'n'dër-sön, KARL JOHAN (1827-67). A Swedish naturalist and South African traveler. In 1850 he joined Francis Galton in a journey in southwest Africa, continued alone through 1853-54, and on his return to England published *Lake Ngami; or, Explorations and Discoveries during Four Years' Wanderings in the Wilds of Southwestern Africa* (1855). He made a journey to Lake Ngami in 1858 with Green, the elephant hunter. On his return he published a book on the Okavango River (1861). In May, 1866, he went on an exploration to the Kunene for the purpose of establishing commercial intercourse with the Portuguese settlements north of that river. He came in sight of the stream, but was too feeble to cross it, and died in trying to return to Cape Town. After his

death his *Notes of Travel in South Africa* (1876) were published.

ANDERSSON, NILS JOHAN (1821-80). A Swedish botanist, born at Gärdserum, Småland. In 1846 he was an instructor in botany at Upsala and in 1847 taught in an elementary school at Stockholm. From 1851 to 1853 he was botanist to the Swedish circumnavigatory expedition, which he described in *En Verldsomsegling* (3 vols., 1853-54). He was appointed an adjunct professor and demonstrator of botany at Lund in 1855, and in 1856 professor and curator of the botanical collections at the Academy of Sciences, Stockholm, and instructor in the Bergiani horticultural school. He also published *Salices Lapponiæ* (1845), *Conspectus Vegetationis Lapponiæ* (1846), *Atlas öfver den Scandinaviska Florans Naturliga Familjer* (1849), *Monographia Salicum Hucusque Cognitarum* (1867), and other works.

ANDES, än'dēz (deriv. uncertain, usually explained as Copper Mountains, from the Peruvian word *anti*, copper; cf. in Germany *Erzgebirge*, Ore-Mountains, and *Bleiberg*, Lead-Mountain). The great mountain chain of South America, extending closely parallel with the Pacific coast and nowhere far from it, from Cape Horn to the northwest coast of the South American continent. Its length is about 4500 miles, extending in latitude from 56° 30' S. to 11° N. In a way it may be regarded as continuous with the Cordilleras of North America, the two forming a well-nigh continuous mountain system 9000 miles in length, stretching from Cape Horn to the Aleutian Islands. The average breadth may be set at 150 miles, although this differs greatly in different parts of the system. Its average height of 12,000 feet is subject to the same qualification. Following the coast, the system trends a little west of south through Colombia and Ecuador, but on entering Peru it turns to the southeast, in which direction it extends through that country and part of Bolivia. Through south Bolivia, Chile, and Argentina its trend is nearly south, but it swings in a broad curve to the eastward near Magellan Strait.

The mountain system rises abruptly on both sides throughout its course. Everywhere it presents a steep wall to the Pacific, and on the east it drops abruptly to the Amazon valley; farther south, in Argentina, the land rises somewhat to meet it, and there are outlying ridges, but the main ascent is everywhere steep. The southern part of the system consists of a single range, with here and there outliers of comparatively little height, but from northern Chile and Argentina to Colombia, it consists of a high, broad plateau, capped by two or three ranges, with hundreds of high volcanic peaks, some active, others dormant or extinct.

Geologically the system is of recent origin, although its age has not been closely determined. The material of which it is composed is in the main granites, with schists, slates, and other metamorphic rocks and the oldest of stratified rocks; here and there upturned beds of more recent formation, up to the Jurassic, lie upon the flanks of the ranges, while in Peru the eastern range is composed largely of Silurian beds. Over all, in the neighborhood of the volcanic peaks, which are very numerous in all parts of the range, are spread lava, pumice, scoria, and ashes, in many places burying deeply the metamorphic rocks. Near the northern end, in Colombia and Venezuela, the eastern branches

are composed of recent stratified rocks. For detailed description it will be convenient to refer to the countries traversed by this mountain system, and this order will be followed, commencing at the north.

Colombia and Venezuela. The Andes originate on the north in Colombia and Venezuela in several distinct ranges, which, trending south to southwest, meet and coalesce in the Pasto Knot in southwest Colombia. The westernmost range of magnitude is the Cordillera Occidental, which rises just east of the mouth of the Atrato, and trends southward, parallel to the coast, throughout Colombia. In this are summits 10,000 and 11,000 feet in height, the highest peaks being in the southern part. Near the boundary line with Ecuador it is cut through by the Rio Patia, which flows south and west into the Pacific. East of the Cordillera Occidental, and separated from it by the narrow valley of the Cauca, a branch of the Magdalena, is the Cordillera Central. This range rises from the lowlands between the Cauca and the Magdalena and attains a great height, with Chumbal, 15,715 feet; Guacau, 16,683 feet; Guican, 15,748 feet; Santa Marta, 19,029 feet; Santa Isabel, 16,732 feet; Herveo, 18,045 feet; Ruiz, 17,388 feet; Sugar-loaf, 16,000 feet; Tolima, 18,425 feet, and many others of equal height. The range is composed mainly of crystalline schists, while the higher peaks are volcanoes, which have spread lava and ashes over many parts of the range. East of the Cordillera Occidental and across the valley of the Magdalena is the Cordillera de Bogota, originating in several ranges in the north of Venezuela, which trend in a general southwest direction and come together at various points; the principal ones are the Parija and Merida ranges, which unite near Bogota, beyond which point the range is single. Its highest peak is Cocui, 16,680 feet high. The range is in the main composed of strongly folded Cretaceous and Tertiary beds, and contains no volcanoes.

Ecuador. The Andes of Ecuador form two ranges, the Cordillera Occidental, the continuation of the range of the same name in Colombia, and the Cordillera Oriental, or Real; the two are separated by a high plateau, from 70 to 100 miles wide, with an average elevation of 8000 feet; connecting cross ranges divide this plateau into 10 basins or high mountain valleys. The western range is composed of porphyries, diorites, and greenstone, and the eastern and higher range is composed of gneiss, schist, and granite. Above them tower many high volcanic cones, which have spread lava and ashes over great areas. The great peak of the western range is Chimborazo, 20,517 feet; with Cotocachi, 16,300 feet; and Pichincha, 15,918 feet, the last named near the city of Quito, while in the eastern range are Cotopaxi, 19,580 feet; Antisana, 19,335 feet; Cayambe, 19,186 feet; Altar, 17,736 feet; Illiniza, 17,380 feet; and Carahuairazo, 16,515 feet, with the active volcanoes Tunguragua, 16,579 feet, and Sangai, 17,120 feet. The cross ranges also contain many volcanic peaks, indicating that the whole region must once have been the centre of tremendous volcanic activity.*

Peru. In Peru, Bolivia, and the northern

* It must be remembered that there is always considerable variation in measurements of very high peaks, due to refraction, changing air pressure, etc. Only a *series* of careful measurements, either by triangulation, barometer, or hypsometer, can approach accuracy.

part of Chile the system is much broader and more complex. The Andes of Peru consist of three ranges, the two westernmost being the Maritime or Black, and the Central Cordillera, trending parallel to one another and to the coast, and in the north separated only by a narrow, high plateau, known as the Puna, with an average height of 12,500 feet, and in the south by the narrow valley of the Rio Huay. The Eastern Cordillera, though otherwise continuous, is cut through by no less than six of the head tributaries of the Amazon. The broad, elevated region lying between this and the Cordillera Central, known as the Sierra, is broken by mountain spurs, with broad valleys and plateaus. East of the Eastern Cordillera, or the Andes, as it is locally known, are several lower ranges, trending parallel with the system and separating tributaries of the Amazon. The Maritime and Central Cordillera are composed of crystalline and volcanic rocks, with stratified beds of Jurassic age resting upon their outer flanks. The Eastern Cordillera is composed mainly of stratified beds of Silurian age, with some intrusions of granite. These ranges are connected at the mountain knot of Cerro de Pasco, 14,293 feet high, and again farther to the southeast, at the Knot of Vilcanota, 17,390 feet. South of this latter peak the Central and Eastern Cordillera inclose the lofty plateau on which is Lake Titicaca, situated partly in Peru and partly in Bolivia, and 12,466 feet above the sea. North of the Cerro de Pasco, the Sierra comprises the upper valley of the Marañon, the largest and longest of the head branches of the Amazon, which cuts through the Eastern Cordillera just south of the Ecuador frontier. Between the Cerro de Pasco and the Knot of Vilcanota, the Sierra is drained by the head streams of the Ucayali, a large tributary to the Amazon. These streams also cut gorges through the eastern range. This region was the site of the ancient Inca civilization and is still thickly settled. Among the high peaks of this part of the Andes are Huascaran, 22,051 feet; Huan-dov, 21,089 feet; Misti, 20,013 feet; Chacani, 19,820 feet; and Tutupaca, 18,960 feet.

Bolivia. In Bolivia the system comprises two main ranges, one of which is formed by the coalescing of the two westernmost of the Ecuador ranges. These ranges are widely separated and inclose a broad, greatly elevated plateau, 125 miles in breadth in the northern part, and nearly 300 miles in the south, with an altitude of almost 13,000 feet. The plateau of the Andes has here the greatest lateral extent and altitude in the entire system. The Western range has an average altitude of 15,000 feet, while the Eastern, or Cordillera Real, is still higher, having peaks exceeding 20,000 feet; among them are Illampu, 21,490 feet; Illimani, 21,930 feet; Ancoluma, 21,490 feet; Haina, 20,171 feet; Paniri, 20,735 feet; Licancaur, 19,521 feet; Sajama, 21,047 feet; Isluga, 17,060 feet; and Cacaca, 20,250 feet, all of them near Lake Titicaca. East of this range are several lower subsidiary ranges, which form a complicated system. Lake Titicaca drains southeastward into Lake Poopo, a sink which collects the waters from a large area of the plateau. In the Cordillera Real and the lesser ranges to the east, rise tributaries of the Madeira, one of the main branches of the Amazon, and of the Pilcomayo, tributary to the Plata.

Chile and Argentina. The broad, high pla-

teau, with its bordering ranges and subsidiary eastern ranges of Bolivia, extends southward into these countries, gradually narrowing and decreasing in altitude, until in lat. 32° the Andes become reduced to a single range, except for spurs and outliers, most of which are of comparatively little importance. In the northern part the altitude of the ranges decreases greatly, Juncal, in lat. 26°, having a height of 17,530 feet, and Copaipó volcano, 19,700 feet. Farther south, in the neighborhood of Santiago, the mountains again become loftier. Here are Mercedario, 22,315 feet; Tupungato, 20,286 feet; San José, 20,020 feet; and Aconcagua, 22,860 feet; this latter peak is the highest summit of the entire system and of the whole continent, so far as known. Still farther south, the range again diminishes in height. In lat. 34° is Maipo volcano, 17,670 feet; in lat. 36° is Descabezado, 12,760 feet; in lat. 42° is Tronador volcano, 9790 feet. Here begins the remarkable fiord coast, which extends south to Cape Horn. The heavy precipitation on the west side of the range here produced in past times extensive glaciers, which chiseled the mountains far down below sea level, producing many islands, and an intricate system of mountain-walled channels. These glaciers have been able, by reason of their rapid descent, to cut back their heads across the range in many places, so that now, after their recession, many of the streams which have succeeded them rise far to the east of the Andes, upon the plains of Argentina, and flow through the range to the Pacific. In this region the mountains become still lower, their height ranging from 4000 to 8000 feet, until they finally disappear at Cape Horn.

The lower limit of perpetual snow, although an extremely indefinite line, varying from year to year with exposure and precipitation, has in general, in equatorial regions, an altitude of about 15,500 feet, but ranges 1000 feet on each side of this figure, being higher on the east and lower on the west side of the range. In other words, it is higher where the precipitation is abundant, and lower where it is scanty. It diminishes as the latitude increases, being about 13,000 feet in the latitude of Santiago, and falling to 3000 feet near the southern point of the continent. Glaciers are found on all the high peaks, even those in equatorial regions, which exceed 13,000 feet in height. Here, however, they are small, descending the mountain slope only a few thousand feet. In southern Chile, on the west side of the range, are many of considerable size, originating upon mountains of inferior height, and descending to sea level, even entering the sea, at the heads of fiords.

Volcanoes. One of the striking features of the Andes is its great number of active and extinct volcanoes. Probably not over 60 are now known to be active, but the extinct ones are numbered by hundreds, and have played a very important part, though a secondary one, in creating the present conformation of the mountain system. Three principal centres of volcanic activity are recognized: one in the Andes of the north, in Colombia and Ecuador, extending in latitude from 5° N. to 3° S.; a second in Peru, Bolivia, and northern Chile, extending from 15° to 28° S.; and a third in central Chile, extending from 32° to 40° S. The highest peaks of the Andes are of volcanic formation, and their peculiar conical forms are distinctive features of the Andean landscape. Many of the most

prominent and highest ones have been mentioned; it remains to speak of those which are now active, or which have been active within historic times, and briefly describe their eruptions.

The northern group, mainly comprised in Ecuador, is the most imposing collection of active and extinct volcanoes on earth. Of these, Cotopaxi, Tunguragua, Sangai, and Pichincha have repeatedly been in eruption in historic times, but most, if not all, of the others have for a long time been quiescent. The Altar, a truncated mountain, 17,736 feet in height, is said to have once been the highest in the region, but after a long period of eruption it collapsed within itself. Ruiz, in Colombia, is still smoking, and Tolima is not quite extinct, but as late as 1829 was in eruption. In 1849 Purace, in southern Colombia, suddenly exploded, flooding the neighboring country and covering it with ashes. A similar eruption took place in 1869. Imbabura, in Ecuador, is said to have discharged a deluge of mud and water at the time of the great earthquake in 1868. Antisana is reported as having been in eruption in 1590, and even now sulphurous fumes arise from it. Cotopaxi, always smoking, has been repeatedly in eruption, although its great eruptions have occurred at intervals of centuries. The last one was in 1877. Tunguragua also is active at irregular intervals, the latest eruption being in 1886. Sangai sends off steam constantly with tremendous force and noise. Pichincha has, since its eruption in 1660, given off nothing but steam and a little ashes.

The middle volcanic group is found in both the eastern and western Cordilleras; in Peru it includes Sarasara, Atchatayhua, Corupuna, Ampato, Chachani, and Misti, all now quiescent. Omate and Tutupaca have been in eruption in historic times; indeed, the former was one of the most active in Peru. In Bolivia are Mount Sorata, or Illampu, Sajama, Aucaquilcha, Chachacomani, Huiana, Cacaca, Mesada, and Illimani, while in northern Chile are many volcanic cones, some of great height; among them are Tacora, 19,750 feet, Chipicani, Pomerape, Parinacota, Iquima, 20,275 feet, and Toroni, 21,340 feet, all in the western range. In the eastern range are Tuachela, Olca, Mino, and Ollagua, all smoking or emitting lava. South of Ollagua are at least 30 extinct volcanoes, exceeding 16,500 feet in height; among them are Autopalla, 20,920 feet, Socompa, 19,620 feet, and Lullailaco, 21,670 feet.

In the central Chilean region are Tupungato, San Jose, Maipo, Tinguiririca, all supposed to be extinct. Las Damas and Peteroa are said to have been in eruption in the last century. The volcanoes grouped about Descabezado are quiescent, though appearances indicate recent eruption. Chilean ranges contain several vents, from which lava and ashes have been ejected in recent years. Autuco also has had eruptions within historic times. Farther south, Villarica volcano has frequently been seen in eruption. In all probability, other active volcanoes exist in the fiord region of South Chile, although none has yet been reported.

Hydrography. The Andes system is the source of most of the larger streams of South America. Through nearly its whole extent, wherever the system comprises more than a single main range, the westernmost of these ranges separates the drainage to the Atlantic from that to the Pacific. In Ecuador, however,

no fewer than seven of the 10 high valleys between the ranges are drained westward, and in southern Chile, as has been seen, glaciers have eroded their sources back across the whole range to the Argentina plains. The western streams are short, and owing to the light rainfall on most of the western slope, have small volume. Hence their cutting power is slight. On the other hand, the streams to the east are long, with great drainage basins, and, except in Argentina, are supplied with abundant precipitation by the trade winds. Hence they are powerful streams of large volume and have eroded their courses far up into the mountains.

The Andes of Colombia are drained northward to the Caribbean Sea by the Magdalena, Cauca, and Atrato rivers, and eastward to the same body of water by the Orinoco, and to the Atlantic by the Negro and Yapurá, great branches of the Amazon. The system in Ecuador, Peru, and most of Bolivia is drained eastward by countless tributaries of the Amazon, among which are the Napo, Marañon, Ucayali, Beni, and Mamore. Of these, the Marañon heads between the ranges far to the south, near the Knot of Cerro de Pasco, flowing northwest within the mountain system for 400 miles before breaking through the eastern range into the Amazon basin. The Huallaga, Mantaro, Apurimac, and Urubamba, tributaries of the Marañon, also head between the ranges, cutting gorges through the eastern range. In Bolivia and northwest Argentina is a great region, 800 miles in length, lying between the ranges, with an average altitude of 13,000 feet, which has no drainage to either ocean. In this region is the great Lake Titicaca, which drains by the Rio Desaguadero to Lake Poopo, where the drainage of this semi-desert region is collected. This lake in earlier times drained to the Amazon, but by shrinkage in volume its outlet has been closed, and now it discharges only by evaporation. The eastern slope of the Andes in southern Bolivia and northern Argentina is drained to the Plata, while farther south shorter streams, the Rio Colorado, the Negro, Chubut, and the Deseado, and the Arroyos Bayo and Salado, and other smaller streams, carry the drainage directly to the Atlantic.

Climate. The climate of the Andes differs widely in different parts, with latitude, altitude, and exposure. The eastern slope of the system from the northern end southward to lat. 25°, comprising the portions drained by the Orinoco and Amazon, and lying almost entirely within the tropics, has a heavy, and in many localities a profuse, rainfall. Farther southward in the temperate zone, in the region of prevailing westerly winds, the rainfall on this side of the range diminishes, becoming very light in Argentina, with only eight inches or less in the driest parts. On the west side of the system the rainfall conditions are very nearly reversed, though in the north, in Colombia, the tropical rainfall passes around the end of the range and extends down the western side for some distance, giving to the valleys of the Magdalena, Cauca, and Atrato abundant moisture, and extending southward along the coast as far as Guayaquil, Ecuador. Thence southward, the western coast is an arid and desert region, as far as lat. 30° S. Below this point the precipitation increases, as the westerly winds bring moisture, and the southern coast is well watered.

From Guayaquil a cooler climate is reached

either by going south or by going directly up the mountains. The base of the mountains, within the tropics, has a mean annual temperature of 80° F. or more, while in southern Argentina it is not more than 25°. Within the tropics the temperature ranges from 80° at the base of the mountains to 20° or less at their summits, a range due to altitude alone. Upon the Titicaca plateau Arctic conditions prevail, with frost every month of the year. Where the rainfall is copious, as it is on the eastern side within the tropics, the range of temperature between summer and winter is slight, while upon the west coast, in the same latitudes, where desert conditions prevail, the range is very great. In general, as the mountains are ascended, the contrasts of temperature become greater, owing to the rarefaction of the air. At great altitudes, even, the contrast between day and night is great. South of the latitude of Coquimbo, 30° S., these temperature conditions are reversed, the west slopes having the smallest annual and diurnal range.

Means of Communication. Routes of travel across the Andes are few in number, the passes are very high, and the roads traversing them are, as a rule, very bad. Communication between the peoples on the two sides of the mountains is slight. The high land between the ranges is the best settled part of these sparsely settled countries, and the inhabitants of these elevated regions have some intercourse with the western seaboard, but very little with the low country to the east. But with the development of the mining industry in the mountains and the exploitation of the rubber resources of the upper waters of the Amazon, means of communication across the range are being continually improved. In Colombia the main routes of travel follow the valleys of the Cauca and the Magdalena, while the chief route across the Cordillera Central is via Quindio Pass, connecting Cartago, on the Cauca, with the valley of the Magdalena and ultimately with the capital, Bogota. In Ecuador the main routes pass north and south through the succession of mountain valleys, connecting with the coast at Guayaquil, by railroad from Chimbo, or northward down the Cauca and Magdalena. The most frequented eastward route crosses the Eastern Cordillera between Saraurcu and Antisana and reaches navigable water in the Napo at Puerto Napo. In Peru the plateau within the ranges is connected with the coast by two railways, which are marvels of engineering. The Oroya Railway connects Lima and Callao with Oroya and Concepcion, crossing the Western Cordillera at an altitude of 15,665 feet, in a distance of 106 miles from Lima. The second railway connects Mollendo on the coast with Lake Titicaca. It crosses the Western Cordillera at an altitude of 14,666 feet and terminates at the little town of Puno, on the shore of Lake Titicaca, 12,540 feet high. Several other short lines run from the coast to the foot of the mountains and even some distance into them, following the stream valleys; among them is the line up the Rio Santa to Huaraz.

The somewhat broken character of the ranges in Peru and Bolivia has made the plateau easier of access than it is farther north, and there are many roads and trails from the coast to the summit; but routes of communication to the east, to the country about the upper waters of the Madeira and Plata, are almost entirely lack-

ing. From Autofagasta in northern Chile, on the coast, a railway has been constructed to Oruro, on the plateau, north of Lake Poopo. This road has a total length of 560 miles, making it much the longest of the Andean lines. In central Chile and Argentina a transcontinental railway from Buenos Ayres to Santiago, was completed in November, 1909. It crosses the Andes at Uspallata or Cumbre Pass, not far from Santiago, at an altitude of 12,340 feet. This is the most frequented pass in Chile, as almost all the transcontinental travel goes over it. In 1912 was opened a line from Arica, Chile, to La Paz, Bolivia. It has a length of 266 miles, and much Bolivian trade follows this route.

Flora. In plant life the Andes is the richest of all the mountain systems in the world. Not only do these mountains sustain at their bases the flora of all climates, from the equatorial zone at the north to the cold zone at the south, but they possess these zones in altitude as well; and moreover, certain species of plant life are peculiar to this special region. Plant life is especially prolific in the rainy regions of Venezuela, Colombia, Chile, and Bolivia. In Colombia the palms and their associated tropical flora extend upward on the Andean slopes to an altitude of about 4500 feet, while above this is a mixed sub-tropical belt, extending to an altitude of nearly 12,000 feet, in which grow the cinchona, tree fern, and wax palm, and still higher up, at an altitude of 10,000 to 12,000 feet, the higher Andean bush growth, including the Andean rose; a species of bamboo also grows at these high altitudes.

Farther to the south, in the region of less rainfall, the flora on the east and west sides of the Andes is quite different. On the west side, in lower Ecuador and Peru, the plant life is poor and is that peculiar to a semi-desert region; but it extends up to high altitudes, lichens being found at 18,500 feet altitude; while on the moister Bolivian and Brazilian side the various altitudinal zones occur, beginning with the rich flora of western tropical Brazil and extending up to the true Andean flora. In northern Chile and western Argentina, where there is a rather light rainfall on both sides of the Andes, there is a continuation of the sparser vegetation of the relatively dry region, and the flora of the two sides of the Andes differs less than elsewhere. In the Chile-Argentina region there is a great contrast between the rich vegetation on the moist Chilean side and the thin vegetation on the dry slopes of Argentina. In the southern part of this Andean region great forests of stunted beech and firs occur in the lowlands and extend part way up the mountain slopes. Southward along the Andean chain the altitudinal zones diminish in width in about the same ratio as the decrease in altitude of the snow line, so that in the south, by making an ascent of less than a vertical mile, one can pass through as many vegetation zones as would be encountered in an ascent of three miles under the equator. The upper limit of tree growth, or the timber line, is a far more definite line than the snow line, yet in many places it is not easy to define. It ranges in the Andes from an average of 11,500 feet under the equator, down to about 3000 feet near Cape Horn. It is higher, for apparent reasons, on the moist than on the dry side of the range; thus, in Ecuador it ranges nearly 1000 feet higher upon the east side than upon the west.

Fauna. In the northern Andes of Venezuela and Colombia, where the tropical and sub-tropical forests extend up to an altitude of 10,000 feet, we find the fauna of tropical America existing up to similar high altitudes. The jaguar, puma, bear, ocelot, monkey, tapir, ant-eater, and capibara are found in these forests. Bird life is abundant, many hundreds of varieties of humming birds are found ranging up to seven inches in length, and the bat family is well represented. Snakes, saurians, and turtles are met in great numbers at lower altitudes. Above 6000 feet in altitude there is a great diminution of animal life. In Ecuador there occur certain representative species of the southern Andes, such as the llama and the condor. Insect life also continues very abundant, and fish are found up to an altitude of 14,500 feet. In the Peruvian and Bolivian Andes on the Pacific side, the fauna, like the flora, is limited, but on the eastern or Brazilian slope is exceedingly rich. The vicuña, guanaco, and alpaca are still found in the wild state, and with them are found the chinchilla and viscacha. On the Bolivian slopes the fauna is much more abundant than in Peru. Farther south on the Andean chain the fauna is less rich, and the larger animals of the northern Andes are not found. Herds of guanacos are numerous, and birds are present in great variety and large numbers, but the reptiles show a decided change of form. At the extreme south the land fauna is but poorly represented.

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ANDES. See **ANGERS**.

ANDES. See **VERGIL, PUBLIUS VERGILIUS MARO**.

ANDESINE. See **FELDSPAR**.

AN'DESITE. A volcanic effusive rock of porphyritic texture composed essentially of lime-soda feldspar (andesine) with black mica (biotite), hornblende, or augite imbedded in a ground mass of smaller crystals or rock glass. The structure may be, but is not necessarily, porous; in most cases the crystals of andesine are arranged roughly parallel, giving the rock its characteristic fluxion or andesitic structure. This structure is due to the flow of the once molten mass in the form of lava. In composition this family of rocks shows wide variations, limited, however, by the rhyolites (q.v.) and trachytes (q.v.) on the one hand, and the basalts on the other. Fairly rich in silica and alumina, they contain moderate amounts only of the heavier and darker bases, viz., iron, lime, and magnesia. They contain from 60 to 70 per cent of silica, 13 to 18 per cent of alumina, 4 to 9 per cent of iron, 3 to 6 per cent of lime, 5 to 9 per cent of alkalis, and smaller percentages of magnesia. They owe their name to

their extensive development in the Andes of South America, though they occur extensively throughout the entire Cordilleran system of mountains, in South, Central, and North America. See **RHYOLITE**; **TRACHYTE**.

ANDI'RA (Neo-Lat. probably from the native Brazilian name). A genus of about 20 species of tropical American and African trees of the family Leguminosæ, having almost orbicular, one-celled, one-seeded pods. *Andira inermis* grows in low savannahs in the West Indies and is there called cabbage tree or cabbage-bark tree. It is a tree of considerable height, having pinnate leaves, with 13-15 ovate-lanceolate leaflets and panicles of reddish-lilac flowers. Its bark, called cabbage bark, or worm bark, is a powerful anthelmintic, and although it has been discarded from the pharmacopœias of Great Britain, it still finds a place in those of other countries, along with Surinam bark, the bark of *Andira retusa* of Surinam. Similar properties reside in the bark of several species of the allied genus *Geoffroya*.

AND'IRON (OF. *andier*, from Low Lat. *andieria*, a fire-dog; the Fr. *landier* stands for *l'andier*). A metal utensil used in burning wood in an open fireplace. It consists of a horizontal bar supported on three short legs with an upright standard at one end. Andirons are employed in pairs, one andiron being placed on each side of the hearth, with the uprights in front and the horizontal bars extending backward into the fireplace, the logs or sticks of wood resting across the horizontal bars. It is usual to make the uprights of various ornamental designs, and, often, to cover them with copper, brass, or silver. Andirons are manufactured by forging, wrought iron being the material of which they are most commonly made. Handirons, fire-dogs, and dog-irons are colloquial names for andirons.

ANDIZHAN, ä'n'dë-zhän'. Capital of the district of Andizhan, territory of Ferghana, Russian Turkestan (Map: Central Asia, Afghanistan, M 1). It is about 42 miles from Margelan, the capital of the territory, and is the eastern terminal point on the Transcaucasian Railway. Cotton is the principal article of commerce. In December, 1902, 1021 lives were lost in an earthquake (3342 in district). The Russians obtained possession of it in 1875. Pop., 1897, 46,680; 1908, 74,316.

ANDKHUI, ä'nd-kōō'ë. A town of Afghan Turkestan, in the border province of Maimene, about 200 miles south of Bokhara (Map: Central Asia, Afghanistan, K 3). It lies on the trade route between Bokhara and Afghanistan. The surrounding region is notably unhealthy, but is fertile. Andkhui is reputed to have been founded by Alexander the Great. Pop., about 15,000, chiefly Mohammedans.

ANDLAU, ä'n'dlô', GASTON HARDOUIN JOSEPH, COMTE D' (1824-94). A French general, born at Nancy. He attended, for a time, the military school at Saint-Cyr, and later, in active service, distinguished himself as a captain in the Crimean War. At the outbreak of the Franco-Prussian War he was appointed a colonel on the general staff of the Army of the Rhine, and subsequently he fought in the battles before Metz. He was elected a Senator in 1876, and promoted to be a general of brigade in 1879. He was involved in the so-called *affaire des décorations*, in which General Caffarel was found guilty of selling decorations of merit, and fled

to South America. He died at Buenos Ayres. He published *De la cavalerie dans le passé et dans l'avenir* (1869) and *Organisation et tactique de l'infanterie française depuis son origine* (1872).

ANDLAW-BIRSECK, änt'läv-bēr'sëk, FRANZ XAVER, BARON VON (1799-1876). A German diplomat and author. He was born at Freiburg and in early life studied jurisprudence at the university there and at Landshut and Heidelberg and in 1824 entered the public service of Baden. From 1826 to 1830, and again from 1832 to 1835, he was secretary of the embassy at Vienna. He was appointed Minister at Munich in 1838; Minister at Paris in 1843, and in 1846 Ambassador Extraordinary at Vienna. He retired in 1856 and subsequently published: *Erinnerungsblätter aus den Papieren eines Diplomaten* (1857); *Mein Tagebuch 1811-61* (1862); *Die byzantinischen Kaiser; ihre Palast- und Familiengeschichten* (1865); *Sieben heilige Fürsten* (1865).

ANDOCIDES, än-dös'ī-dēz (Gk. Ἀνδοκίδης, *Andokidēs*) (born c.440 B.C.). An Athenian, of high family, the least of the Ten Attic Orators. In 415 he was involved with the younger members of the aristocratic party in the charge of mutilating the Hermæ. (See **ALCIBIADES**.) The charge sprang from the fact that the Hermes before his house was left un mutilated. To protect himself, he betrayed some of his associates, but suffered partial loss of civic rights and went to Rhodes, where he engaged in trade. From 407 he lived in Elis. The amnesty of 403 allowed him to return to Athens. In 399, however, when he had gained prominence in public life, he was charged with impiety because, though barred from the Eleusinian Mysteries by the decree of 415, he had nevertheless attended the festival. By his speech *On the Mysteries* he secured his acquittal. In 391 he was sent to Sparta to negotiate a peace. On his return he was unable, in spite of his speech *On the Peace*, to persuade the Athenians to accept the treaty, was charged with mismanagement, and, it is said by some, was banished. The date of his death is unknown. Three of his speeches are extant: *On his Return* (410 or 409), *On the Mysteries* (399), *On the Peace* (391). The oration *Against Aleibiades* is spurious, and the authenticity of *On the Peace* has been doubted by Sittl, *Griechische Litteratur*. Consult Jebb, *Attic Orators* (London, 1876-80), and Blass, *Attische Beredsamkeit* (Leipzig, 1887-98).

ANDORRA, än-dör'ra. A republic in the valley of the same name in the eastern Pyrenees, between the French department of Ariège, and Catalonia, in Spain (Map: Spain, F 1). The valley is inclosed by mountains, through which its river, the Balira, breaks to join the Segre at Urgel. It leads a semi-independent existence under the protection of France and the Bishop of Urgel. Its area is 175 square miles, and it is divided into six parishes. There is much excellent pasture; vines and fruit trees flourish on the lower grounds, and the mountains contain rich iron mines. The limited area of arable land makes the republic partly depend upon France for its grain. The chief industry is the production of coarse cloth. Small quantities of wool, ores, cloth, and dairy products are exported.

Andorra was declared an independent state by Charlemagne, in reward for services rendered to him by its inhabitants when he was

marching against the Moors. In 1278 Andorra was transferred to the Comte de Foix and the Bishop of Urgel and was administered by two *viguiers* appointed by them. During the French Revolution the relations between Andorra and France were interrupted on account of the latter's refusal to accept the annual tribute, which was considered incompatible with a republican form of government. In 1806, however, the former relations were renewed, and the free importation of cereals from France was allowed in consideration of an annual tribute of 960 francs. The republic is governed by a sovereign council of 24 members, chosen for a period of four years by the heads of the communities. The council is presided over by two syndics, both chosen by the members of the council, one for life and the other for a term of four years. There are two judges called *viguiers*, of whom the first, a French subject, is appointed by France, and the second, a native, by the Bishop of Urgel. There is also a civil judge, appointed by France and the Bishop of Urgel alternately. Under each *viguiers* is an inferior judge called a *bailie*; there is an appeal from his judgment to the civil judge, and finally to the Court of Cassation at Paris, or to the episcopal college at Urgel. In criminal cases there is no appeal from the Court of the Republic itself, in which the first *viguiers* presides. The revenue of the state is derived from lands and from some inconsiderable taxes. The Bishop of Urgel receives from the republic an annual sum of 460 francs. The manner of life of the Andorrans is very simple. There are schools, but education is in a low state. Every able-bodied citizen of the republic is liable to military service between the ages of 16 and 60. In the Carlist wars the neutrality of Andorra was strictly respected, though various complications resulted from its connection with the Bishop of Urgel. The capital, Andorra, is situated in the mountains and has a population of about 1000. The population of the republic is 5231. Consult: Spender, *Through the High Pyrenees* (London, 1898); Deverell, *History of the Republic of Andorra* (Bristol, 1885); Tucker, *The Valley of Andorra* (Cambridge, Mass., 1882).

AN'DOVER. A municipal borough and market town in the county of Hampshire, England, 12 miles northwest of Winchester, on the river Anton (Map: England, E 5). It has manufactures of iron and malt. There are remains of Roman villas in the vicinity. Pop., 1901, 6509; 1911, 7596.

ANDOVER. A town of Essex Co., Mass. It includes several villages and lies south of the Merrimac. The town proper is 23 miles north of Boston, on the Boston and Maine Railroad, and on the eastern bank of the Shawsheen River (Map: Massachusetts, E 2). It produces linen, twine, and shoe-thread, woolen goods, rubber goods, printers' ink, brushes, automobile tubes, and other manufactures. Andover is the seat of the Phillips Academy for boys, founded in 1778, and Abbot Academy for young ladies. It has a public library and owns and operates its water works. The government is administered by town meetings, annual and special, which elect as executive officers three selectmen, make appropriations, and transact other business. First settled in 1643, Andover was incorporated as a town in 1646. It was within the area especially affected by the witchcraft delusion of 1692, and three of its citizens were con-

victed and executed at Salem, many more being tried and acquitted. On March 5, 1698, it was attacked by Indians, who killed five of the inhabitants and burned a number of the buildings. Consult Abbot, *History of Andover* (Andover, 1829), and Bailey, *Historical Sketches of Andover* (Boston, 1880). Pop., 1890, 6142; 1900, 6813; 1910, 7301.

ANDOVER THEOLOGICAL SEMINARY, situated in Cambridge, Mass., whither it was removed in 1908 from Andover, Mass. Not only one of the oldest but one of the most famous theological schools in America, founded in 1807. Although under the control of Congregationalists, it is free to Protestants of all denominations. All applicants must present a college diploma. The Seminary is affiliated with Harvard University, and Andover students are admitted to all courses offered by the Harvard faculties of Arts and Sciences and Divinity. The Harvard theological collections are housed in the Andover building with the Andover collections, and the united library contains about 110,000 volumes, including rare and precious editions and collections. In 1913 there were seven professors, two lecturers, and one instructor. The buildings are valued at \$300,000. The endowments are about \$745,000. President, Albert Parker Fitch, D.D. See Woods, *A History of Andover* (Boston, 1884).

ANDOVER THEOL'OGY. See NEW THEOL'OGY.

ANDRADA E SILVA, ân-drä'dä ê sêl'vá, BONIFACIO JOSÉ D' (1765-1838). A Brazilian statesman and author, born at Santos. He studied in Europe, became professor of geognosy and metallurgy in the University of Coimbra, Portugal, and perpetual secretary of the Academy of Sciences at Lisbon. Having returned to Brazil in 1819, he advocated independence and in 1822 and 1823 was Minister of the Interior under Dom Pedro I. From 1823 to 1829 he was in banishment in France by reason of his liberal views. He published *Poesias d' Americo Elyseo* (Bordeaux, 1825), and writings on mineralogy.

ANDRADE, ân-drä'dä, FRANCESCO D' (1859—). A distinguished Portuguese baritone. He was born in Lisbon, but received his musical education in Italy under Miraglia and Ronconi. He made his début at San Remo as Amonasro in *Aida* and rapidly became famous over all Europe. In Germany he is regarded as the greatest living baritone. He is not connected with any opera house, but appears only as "guest."

ANDRAL, ân'dral', GABRIEL (1797-1876). A celebrated French physician, member of the Institute, born in Paris. In 1823 he published the first volume of his *Clinique médicale*. In 1827 he was appointed professor of hygiene in the University of Paris, and in 1830 professor of internal pathology. His paper *Sur l'anatomie pathologique du tube digestif* ('On the Pathological Anatomy of the Alimentary Canal') was greatly admired, and in 1829 he produced a *Précis élémentaire* on the same science. His *Clinique médicale* treats principally of diseases of the chest, abdomen, and brain. In 1839 Andral succeeded Broussais in the chair of pathology and general therapeutics. His other works include *Projet d'un essai sur la vitalité* (1835), an edition of Lænnec's *Traité de l'auscultation médiate ou traité du diagnostic des poumons et du cœur* (1836), *Cours de patholo-*

gie interne (1836-37), *Sur le traitement de la fièvre typhoïde par les purgatifs* (1837), *Traité élémentaire de pathologie et de thérapeutique générale* (1843). His father, Guillaume Andral, was also a physician of note.

ANDRASSY, än'drä-shī, GYULA or JULIUS, COUNT (1823-90). An Hungarian statesman, born at Zemplén. He was in the Presburg Diet in 1847-48, and in the revolution of 1848 became an earnest adherent of the popular cause and was sentenced to death for his part in the uprising. He fled from the country and remained an exile in France and England until the general amnesty of 1857. Returning home, he was elected a member of the Diet in 1861 and was vice president of this body in 1865.

After the reconstruction of Austria-Hungary on a dual basis, Andrassy became Hungarian Prime Minister, and under his direction the Hungarian Constitution was developed to include such liberal measures as the freedom of the press and the right of public meeting. He also carried a law abolishing the political and civil disabilities of Jews, a measure bitterly opposed by all the Hungarian aristocrats. Andrassy succeeded Count Beust in 1871 as Minister of Foreign Affairs of the Austro-Hungarian Empire. Acting in harmony with Bismarck, he drew up and presented to the Porte in 1876 the famous "Andrassy Note," which set forth the irreducible minimum of reforms demanded by the Christian Powers in respect to Bosnia and Herzegovina. In 1878 he was the chief representative of Austria-Hungary at the Congress of Berlin and negotiated with Bismarck in 1879 the Austro-German alliance. He brought about the occupation of Bosnia-Herzegovina by the dual monarchy, but the step was so unpopular that it was partly the cause of his resignation in 1879. In his place in the Upper House he regained his popular influence as a leader of reform, and his death was considered a national calamity. The making of the Hungarian State and Constitution was largely the result of Andrassy's efforts. Consult: Benjamin Kallay, *Memoirs* (1891); Mano Konyi, *Recollections of Count Andrassy* (1891); E. von Wertheimer, *Graf Julius von Andrassy; sein Leben und seine Werke*, vol. i (Stuttgart, 1910).

ANDRASSY, JULIUS (1860—), son of the preceding, entered the Reichstag in 1884, became under-secretary in the ministry of Wekerle in 1892, secretary of education in 1893, and in the following year Hungarian Minister near the person of the King. He left the Liberal party in 1898, but returned in 1899 after the fall of the Bánffy ministry. In 1905 he was one of the leaders of the Coalition which brought about the fall of the Liberal Siza ministry. In 1906 he became Minister of the Interior in the compromise Wekerle cabinet and held that office until the fall of the ministry in 1909. In 1912 he represented Austria in the diplomatic endeavor to prevent the outbreak of the Balkan War. He wrote *Ungarns Ausgleich mit Oesterreich vom Jahre 1867* (1897); *The Development of Hungarian Constitutional Liberty* (Eng. trans. of Hungarian text, London, 1908).

ANDRÉ, än'drä', CHARLES (1842—). A French astronomer, born at Chauny (Aisne). In 1877 he became professor of astronomy at Lyons, and director of the observatory in that city, in which capacity he visited the Rocky Mountains and Australia to observe the transit of Venus. Among his principal works is *L'as-*

tronomie pratique et les observations en Europe et Amérique depuis le milieu du XVIIe siècle jusqu'à nos jours (5 vols., 1874-82).

ANDRÉ, ăn'dră or ăn'drĭ, JOHN (1751-80). An English soldier in the American Revolution who met his death under circumstances which have given his name a place in history. He was born in London of Genevese and French parentage, entered the English army at the age of 20, and in 1774 joined his regiment in Canada. He was captured by General Montgomery in November, 1775, at St. Johns, and until December, 1776, when he was exchanged, he was held as a prisoner at Lancaster, Pa. He was promoted to be captain in 1777, and soon afterward became an aid to Gen. Charles Grey. In the following year he was raised to the rank of major, and was appointed adjutant-general of the English army in America and aid to Sir Henry Clinton. During the negotiations between Clinton and General Arnold, in 1780, for the betrayal into the hands of the British of West Point, with its stores and magazines, including nearly the whole stock of powder of the American army, Major André acted as the confidential agent of General Clinton and attended to most of the correspondence. In order to perfect plans for carrying out the plot, André, under the assumed name of "John Anderson," left New York on September 20, ascended the Hudson in the British sloop-of-war *Vulture*, and on the 21st and 22d met Arnold in secret and made the necessary arrangements. During their interview the *Vulture* was forced down stream by the fire of an American battery, and André, armed with a pass from Arnold and disguised (against General Clinton's explicit instructions) as a civilian, started on horseback for New York, carrying several incriminating papers, in Arnold's handwriting, concealed in his boots. Near Tarrytown at 9 A.M. on the 23d—when almost within sight of the British lines—he was captured by three American militiamen (John Paulding, David Williams, and Isaac Van Wart), who found the documents and, refusing all bribes, handed their prisoner over to Lieutenant-Colonel Jameson, by whom Arnold was blunderingly notified and thus enabled to escape. A military court, presided over by Gen. Nathanael Greene, and consisting of six major-generals and eight brigadiers, convened on September 29, at Washington's request, and unanimously convicted André of being an English spy. In accordance with military usage, he was therefore condemned to be hanged, and on October 2 the sentence was carried out at Tappan, N. Y., André behaving with the utmost courage and serenity and calling upon the American officers to witness that he died like a brave man. His fate aroused much sympathy everywhere, and his death was passed into history as one of the most pathetic incidents of the Revolutionary War; but it is now generally recognized, both in this country and in England, that Washington could not have acted otherwise than as he did, and that, by the rules of war, André clearly brought upon himself the punishment he received. A monument was erected to André's memory in Westminster Abbey, and in 1821 his body was disinterred at Tappan and conveyed to a grave near the monument.

André had a singularly attractive personality, which has added much to the general interest in his fate. Vivacious, witty, and strikingly handsome, he had, moreover, a charm of manner

which made him a general favorite in the English army and endeared him even to the American officers who came in contact with him during his captivity. He was, besides, remarkably versatile and, in particular, had considerable literary, artistic, and musical talent. A fluent and pleasing writer, he carried on much of Clinton's correspondence and wrote many fugitive verses, some of which, such as *The Cow Chase*, *Yankee Doodle's Expedition to Rhode Island*, and *The Affair between Generals Howe and Gadsden*, were very popular at the time in the English army. During the winter spent by the English in Philadelphia he was the life and soul of all the gayeties and festivities there, and took the leading part in the famous "Mischi-anza"—a pageant given in honor of the departing Lord Howe. Interest in André has been much heightened, also, by the romantic story of his early attachment to a Miss Honora Sneyd, of Lichfield, England, who was subsequently married to the father of Maria Edgeworth.

In vol. vi of the *Memoirs of the Historical Society of Pennsylvania* (1858) is the "Case of Major André, with a Review of the Statement of it in Lord Mahon's History of England," by Charles J. Biddle—an essay containing a full narrative of the case, with a discussion of all the questions of law and duty raised in connection with it. Consult also an excellent work by Sargent, *Life and Career of Major John André* (new ed., New York, 1902); Lossing, *Two Spies* (New York, 1886); and André's *Journal* (Boston, Mass., The Bibliophile Society, 1904). Many of the documents relating to André's capture, trial, and conviction are contained in H. W. Smith's *Andreana* (Philadelphia, 1865), and in Dawson, *Papers Concerning the Capture and Detention of Major John André* (Yonkers, 1866).

ANDRÉ, ăn'dră', LOUIS JOSEPH NICOLAS (1838-1913). A French general, born at Nuits-St. Georges (Côte-d'Or). He served through the siege of Paris, in 1893 became brigadier-general and head of the Ecole Polytechnique, and in 1899 was made general of division. In May, 1900, he entered the Waldeck-Rousseau cabinet as minister of war, retaining his post under the Combes ministry. He was active in combating anti-Republican agitations in the army and resorted to a system of espionage over army officers which led to violent debates in the chamber of deputies in the fall of 1904. Following an assault at the hands of a Nationalist deputy, he resigned, November 14.

ANDREA, ăn-dră'a, GEROLAMO MARQUESE D' (1812-68). An Italian Cardinal. He was born at Naples, educated at the Collège La Flèche, France, and was early appointed Archbishop of Mytilene in *partibus infidelium*. In 1852 he was appointed Cardinal-abbot of Subiaco, and Prefect of the Congregation of the Index, and in 1860 Bishop of Sabina. He took sides with the Patriotic party in 1859 on the question of the national unity of Italy, and at the same time counseled extensive liberal reforms in Church policy. He was suspended from his diocese and abbacy and threatened with permanent deposition from office. He ultimately submitted, and in 1868 was rehabilitated, without, however, being restored to his diocese and the abbacy of Subiaco.

ANDREA DEL SARTO. See SARTO.

ANDREÆ, JAKOB, called SCHMIDTLEIN (1528-90). A German theologian. He was born at Waiblingen; graduated at Tübingen; preached in Stuttgart and Tübingen, and

was very active in promoting the Reformation throughout Württemberg, where he was court preacher. He attended the diets of Ratisbon and Frankfort (1557) and Augsburg (1559), became professor of theology in the University of Tübingen (1562), and provost of the church of St. George. He was active in Protestant discussions and movements, particularly in the adoption of a common declaration of faith by the two parties, the Formula of Concord (1577). In the latter part of his life he traveled in Bohemia and Germany, working for the consolidation of the Reformation, conferring with pastors, magistrates, and princes. He was the author of more than 150 works, nearly all polemical and vigorously written, for the most part directed against Calvinism. For his life, consult Schmoller (Gütersloh, 1890).

ANDREÆ, JOHANN VALENTIN (1586-1654). A German theologian, born at Herrenberg, near Tübingen. He studied at Tübingen, obtained ecclesiastical preferments in the Protestant church of his native country, and became chaplain to the court at Stuttgart, where he died. His writings are remarkable for the wit and humor, as well as for the learning, acuteness, and moral power, which they display. He was erroneously regarded as the founder, or at least the restorer, of the order of the Rosicrucians (q.v.), and this opinion seemed to be supported by reference to three publications: the *Chymische Hochzeit Christiani Rosenkreuz* (1616), the *Fama fraternitatis R. C.*, i.e., *Rosaceæ Crucis* (1614), and the *Confessio fraternitatis R. C.* (1615), of the first of which he acknowledged himself the author, and the other two have so much resemblance to it as to be evidently from the same pen. His intention seems to have been not to promulgate secret societies of mystics and enthusiasts, but to ridicule the follies of the age. He attacked Rosicrucianism itself in some of his later writings. Among the best of his works are his *Menippus s. Satyricorum Dialogorum Centuria* (1617) and *Mythologia Christiana* (1619). He wrote an allegoric poem called *Die Christenburg* (Stuttgart, 1836). For his life, consult Glöckler (Stuttgart, 1866).

ANDREÆ, LAURENTIUS, or LARS ANDERSSON (1480-1552). A Swedish reformer. He was born at Strengnäs, about 40 miles west of Stockholm, 1480; died there April 29, 1552. He studied at Rome, but came home a Protestant, and introduced the reformed faith into Sweden, 1523. He was made Chancellor by Gustavus Vasa, who desired him to translate the Bible, in which work he was assisted by Olaus Petri (New Testament, 1526; Old Testament, 1540). After 1540 he lost the royal favor and lived in retirement.

ANDREANI, än'drà-ä'nè, ANDREA (died, 1623). The most prominent Italian wood engraver in chiaroscuro. The year of his birth is unknown, but his earliest block is dated 1584, his latest 1611. He was born at Mantua and was active chiefly at Florence, Siena, and Mantua. His chief works include the "Pavement of Siena Cathedral," twelve vast prints after Beccafumi; "The Deluge," and "The Destruction of Pharaoh's Host" (1585), both large prints after Titian; and Mantegna's "Triumph of Cæsar" (10 prints, 1598), his best work. Andreani frequently signed blocks which he did little more than retouch. He was one of the world's greatest masters of chiaroscuro engraving. (See WOOD ENGRAVING.) He excelled especially in the arrangement of light and shade,

but his drawing was also correct and sure. From using a similar monogram, his work has sometimes been mistaken for that of Albrecht Altdorfer.

ANDREA PISANO. See PISANI.

ANDREASBERG, än'drà-äs'bèrk, SANKT. A town of Hanover, Germany, in the Harz Mountains, about 27 miles northeast of Göttingen. It was settled as the centre of a rich mining district, yielding iron, copper, silver, lead, cobalt, and arsenic. It lies at the south foot of the Brocken. Its location, 1825 feet above the sea, and its fine climate have made it a tourist and health resort. Pop., about 4000.

ANDREAS CHESNIUS. See DUCHESNE, ANDRÉ.

ANDREE, än'drà, KARL THEODOR (1808-75). A German geographer and journalist. He studied history at Jena, Göttingen, and Berlin, and from 1830 to 1855 was active in journalism. He then gave his attention to geographical and ethnological studies, publishing among other works, *Nordamerika in Geographischen und Geschichtlichen Umrissen* (1851; 2d ed., 1854), *Buenos Aires und die Argentinische Republik* (1856); *Geographie des Welthandels* (1867-77; new ed. by Franz Heiderich and Robert Sieger, 1909). In 1861 he founded the *Globus*, a geographical and ethnological publication.

ANDREE, RICHARD (1835-1909). A German ethnographer and geographer, son of the preceding, born in Brunswick. He studied natural sciences at Leipzig, and from 1859 to 1863 worked as a foundryman in Bohemia, for the purpose of studying the German-Czech race conflict. He was editor of the *Globus* from 1891 to 1903. In 1902 he became professor at the University of Munich. The books embodying the results of his observations in Bohemia are written from the German nationalist point of view. They include *Nationalitätsverhältnisse und Sprachgrenze in Böhmen* (1870) and *Tschechische Gänge* (1872). His later and better-known works comprise *Zur Volkskunde der Juden* (1881), *Die Metalle bei den Naturvölkern* (1884), *Die Masken in der Völkerkunde* (1886), *Die Flutsagen* (1891), and *Braunschweiger Volkskunde* (1896).

ANDRÉE, än'drà, SALOMON AUGUST (1854-97?). A Swedish scientist and aëronaut, born at Grenna. He studied at the technical college in Stockholm and was a member of the Swedish meteorological expedition in 1882-83. Between 1892 and 1895 he made several balloon journeys and finally decided to attempt to reach the North Pole by means of a balloon, partly directed by sails and guide-ropes. On July 11, 1897, accompanied by two friends, Strindberg and Fränkel, he made the start from Dane Island, northwestern Spitzbergen. Four days afterward a carrier pigeon, shot on the sealer *Alken*, was found to convey in a small tube a message written by Andrée two days after the ascent. The message gave the position of the party as lat. 82° 2', long. 15° 5' E., or 145 miles north and 45 miles east of the starting point. Of the thirteen buoys carried in the balloon, five have been discovered on coasts near Spitzbergen. Two contained dispatches, both dated July 11. The "polar buoy," which was to be cast overboard from the highest latitude attained, was found empty, at Spitzbergen, Sept. 11, 1899. Consult Kullenbergh, *Andrée, hans Lif och Person* (Göteborg, 1898), and *Annual Report of the Smithsonian Institution for 1898* (Washington, 1898).

ANDRÉEV, än-drä'yéf, LEONID NIKOLAEVITICH (1871—). A Russian writer of the new school. He was born at Orel and studied law at the universities of Moscow and St. Petersburg. The struggle for existence caused him to attempt suicide at 23. Finding his law practice very unremunerative, he became police-court reporter for a Moscow daily, performing the routine of his humble calling without attracting any particular attention. His first story published was *About a Poor Student*, a narrative based upon his own experiences. It was not, however, until Gorky discovered him by stories appearing in the *Moscow Courier* and elsewhere that Andréev's literary career really began. From that day to this he has been one of the most prolific writers in Russia, producing short stories, sketches, dramas, etc., in frequent succession. His first collection of stories appeared in 1901 and sold a quarter million copies in a short time. Andréev was hailed as a new star in Russia, where his name soon became a by-word. Even outside of Russia his work is better known than that of any of his contemporaries, translations having appeared in all European languages. The following are available in English: *The Red Laugh* (1905), a gruesome narrative of the Russian-Japanese War; *The Burglar* (*Current Literature*, May, 1905), a sentimental sketch; *His Excellency the Governor* (*Harper's Weekly*, Feb. 9 to March 2, 1907), a short story depicting the fear of death; *To the Stars* (*Poet Lore*, Winter, 1907), a four-act poetic drama; *Lazarus* (*Current Literature*, May, 1907), a bold version of the biblical story; *The Life of Man* (*Oxford and Cambridge Review*, Midsummer, 1908), a five-scene mystery play; *The Seven Who Were Hanged* (1909), a story dealing with capital punishment; *Judas Iseariot and the Others* (1910), an attempt to re-create a universal tradition; *A Dilemma* (1910), a story of murder and madness; *Anathema* (1910), a tragedy in seven scenes; *Silence and Other Stories* (1910), tales of horror; *Life is so Beautiful to the Resurrected* (*Current Literature*, September, 1910), a fantasy; *Love of One's Neighbor* (*The Glebe*, January, 1914), a satire.

Andréev occupies a most peculiar position in modern Russian literature. Although he started out in the traditional Russian vein, he soon startled his readers by his eccentricities, which have grown even faster than his fame. As a writer he baffles classification. He is not a realist in the ordinary sense of the term, nor is he a romanticist. He is an unmistakable mystic, whose philosophy, so far as can be inferred from his works, is that of fatalism; most of his heroes land either in the grave or in the madhouse. Moreover, he seems to be notably deficient in synthetic power and normal human sympathy; hence he has not created any real characters nor given us any types, while the writing of novels seems to be entirely beyond him. He has unusually keen analytic power, however, and is undoubtedly an original and very brilliant writer, though he can hardly be ranked among the truly great Russian writers with whom he is erroneously compared by non-Russian readers. Indeed, it is not altogether likely that Andréev's sudden fame will endure beyond his day and generation.

ANDREINI, än'drä-ē'nē. A family of Italian actors and playwrights.—FRANCESCO ANDREINI (c.1548–1624), a Pistoian, whose real name was Francesco dei Cerarchi dal Gallo, began life as

a soldier and was captured by the Turks. Escaping from slavery, he joined, about 1577, the famous comic company of the Gelosi and became celebrated in the part of the braggart Captain Terror of Hell Valley. In 1604 he retired from the stage and devoted himself to literary work, publishing among other things his most famous work, *Le bravure del capitano Spavento* (Venice, 1607), which was translated into French by Jacques de Fonteny (Paris, 1608), and his *Ragionamenti fantastici* (Venice, 1612). His wife Isabella (1562–1604), daughter of Paolo Canali of Venice, one of the most celebrated women of her time, by her wonderful voice, her beauty and wit, became the mainstay of the Gelosi. At her death in Lyons a medal was struck in her honor bearing the words *Æterna Fama*. Her writings include the pastoral drama *Mirtilla*, a number of lyrics, and a collection of letters.—Their son, GIAMBATTISTA ANDREINI (1578–c.1650), on the dissolution of the Gelosi in 1604, founded the company of the Fedeli, where, in the rôle of Lelio, he came to European fame, filling brilliant engagements at Paris under Louis XIII, at Milan and Mantua and in Germany. He is the author of several comedies in the style of his time. To offset the agitation made against the comedy by moralists, he composed a number of religious dramas, the most noted of which is the *Adamo* (Milan, 1613), from which many critics, from the time of Voltaire on, have insisted that Milton derived the conception of his *Paradise Lost*. Andreini's *Teatro celeste* was published at Paris in 1625. His wife, Virginia Andreini (c.1583–c.1628), was equally famous in the Fedeli in the part of Florinda. Her reputation as a singer was made in the *Arianna* of Rinuccini-Monteverdi, at Mantua in 1608. Her portrait was painted by Bronzino, and she was celebrated by many poets of the time, notably by Marino. For the Andreini family consult: E. Bevilacqua, "Giambattista Andreini e la compagnia dei Fedeli" (in the *Giornale storico della letteratura italiana*, vol. xxiii, p. 76, and vol. xxiv, p. 82); E. Allodoli, *Giovanni Milton e l'Italia* (Prato, 1907); W. Smith, *The Commedia dell' arte* (New York, 1912); and Rasi, *Comici italiani* (Florence, 1897).

ANDREOLI, än'drä-ō'lē, GIORGIO (c.1465–c.1555). An Italian designer and maker of majolica ware, one of the most famous of the Renaissance. He was born at Intra on Lago Maggiore (not at Milan, as is usually supposed), and settled in 1485 at Gubbio, where the potter's art was under the enlightened patronage of the Duke of Urbino. In 1498 he became a citizen of Gubbio and in 1518 invented his remarkable lustre, the chief characteristics of which are its beautiful gold and carmine colors. Good examples of his majolica may be found in the local museums of Gubbio, Urbino, Arezzo, and elsewhere in Italy, and also in the principal museums of decorative art in Europe, such as Berlin, Vienna, Paris, and South Kensington. Not all works fired with his lustre were designed by him, for potters of the neighboring cities brought their work to him to be fired. He was assisted in his work by his brothers Salimbene and Giovanni, and after his death it was continued by his son Vincenzo.

ANDRÉOSSI, än'drä-ō'sē, ANTOINE FRANÇOIS, COUNT (1761–1828). A French statesman, born at Castelnaudary, in Languedoc. He was the great-grandson of François Andréossi, who,

with Riquet, constructed the canal of Languedoc in the seventeenth century. He entered the army as a lieutenant of artillery in 1781, joined the revolutionists, rose rapidly in military rank, served under Bonaparte in Italy and Egypt, accompanied him on his return to France, and took part in the *coup d'état* of the eighteenth Brumaire. He was Ambassador at London during the Peace of Amiens, and was made Governor of Vienna after the battle of Wagram. He was for some time Ambassador at Constantinople, from which he was recalled by Louis XVIII. He was raised to the peerage by Napoleon after the return from Elba. After the battle of Waterloo he advocated the recall of the Bourbons, but as deputy from the department of Aude he generally sided with the opposition. He was a man of eminent scientific attainments and distinguished himself as a member of the institute founded at Cairo. He wrote extensively on military history, with particular reference to the artillery arm; and also a *Histoire du Canal du Midi*, in which he asserted the right of his great-grandfather to honors long enjoyed by Riquet. Consult Marion, *Notice nécrologique sur le Comte Andréossi* (Paris, 1846).

ANDRÉS, ân-drās'; JUAN (1740-1817). A Spanish scholar, born at Planes (Valencia). He entered the Jesuit order and after its expulsion from Spain (1767) withdrew to Italy, where for a time he taught philosophy in the College of Ferrara. Afterward he was royal librarian at Naples. In 1815 he became blind. His works are: *Prospectus de Philosophiæ Universæ Publicæ Disputatione Proposita in Templo Ferrariensi* (1773); *Saggio della filosofia di Galileo* (1776); and *Dell' origine, dei progressi e dello stato attuale d' ogni letteratura* (7 vols., 1782-99).

AN'DREW (Gk. Ἀνδρέας, *Andreas*). An Apostle, brother of Simon Peter, born in Bethsaida of Galilee. He was originally a disciple of John the Baptist, but was one of the first called of the disciples of Jesus, and was finally chosen by him from among his larger following to the apostolic office. (See list of apostles in Mark iii. 13-19, with Matthew and Luke parallels.) During the ministry of Jesus he is connected with incidents recorded in John iv. 8; xii. 22; Mark xiii. 3, 4. In Acts he is mentioned only in a list of apostles (i. 13). Subsequent tradition regarding his preaching in Scythia, northern Greece, and Epirus, and suffering martyrdom on a cross shaped like the letter X about 70 A.D., is worthless. See APOSTLE.

ANDREW I. King of Hungary from 1046 to 1061, and cousin of St. Stephen, the apostle of Christianity in Hungary. He owed his choice to the party in opposition to German influence and the spread of Christianity. When firmly established on the throne, he interdicted the pagan cults. Andrew fought with varying fortunes against Henry III of Germany and against his own brother, Béla, whom he had exiled. He was finally defeated, and Béla succeeded him. See Leger, *History of Austro-Hungary* (Eng. trans., New York, 1889).

ANDREW II (1175-1235). A King of Hungary who ascended the throne in 1205. In 1217 he conducted an unsuccessful crusade against the Moslem powers. In 1222 he had to sign the Golden Bull, called the Magna Charta of Hungary, which defined and confirmed the rights and titles of the bishops and nobles whose revolts had disturbed his reign. See GOLDEN BULL.

ANDREW III (?-1301). The last Hungarian King of the Arpád family, grandson of Andrew II. He was born in Venice, while his father was in exile, and succeeded Ladislas IV in 1290. He had to defend his crown against the pretensions of Rudolph of Hapsburg and also against a son of the King of Naples, who claimed to be of the house of Arpád through his mother. The latter was actively supported by Pope Nicholas IV. Andrew made some efforts to develop trade, and his reign was successful on the whole.

ANDREW, A (BRAM) PIATT, JR. (1873-). An American economist and public official, born at La Porte, Ind. He graduated from Princeton in 1895; studied at the universities of Halle, Berlin, and Paris in 1897-99; and, just previous to receiving the degree of Ph.D., at Harvard University in 1900. For the following nine years he was instructor and assistant professor of economics at Harvard. On the creation of the National Monetary Commission in 1908 he became its expert assistant and editor of its publications, a capacity in which he compiled and collected one of the most complete libraries of books bearing on finance and banking ever gathered. In 1909 he was appointed Director of the Mint, and in June, 1910, Assistant Secretary of the United States Treasury. The latter office he resigned, however, in June, 1912, at the same time making public a severe criticism of the conduct of the Treasury Department under Franklin McVeagh. He wrote much on economic and financial subjects in reviews and magazines and became an officer of the French Academy and treasurer of the American Red Cross Society. Among his publications are *Banking Systems and Currency Reform* (1910); *Purpose and Origin of the Proposed Banking Legislation: Three Addresses* (1911).

ANDREW, JAMES OSGOOD, D.D. (1794-1871). A Methodist bishop. He was born in Wilkes Co., Ga., May 3, 1794, became (1816) an itinerant Methodist Episcopal preacher of South Carolina Conference, until consecrated bishop at Philadelphia in May, 1832. On his relations to slavery began the first territorial cleavage of the Methodist Episcopal church. His second wife, whom he married in 1844, was a slaveholder, and in the general conference of 1844 it was declared that "this would greatly embarrass the exercise of his office as an itinerant general superintendent, if not in some places entirely prevent it," and it was resolved "that it is the sense of this general conference that he should desist from the exercise of this office so long as this impediment remains." The Southern delegates protested that the action was extrajudicial and unconstitutional, and the difficulty was finally settled by dividing the churches and property, a church being formed called the Methodist Episcopal Church, South. Bishop Andrew adhered to the South, and continued his episcopal work until 1868, retiring then from age. He died in Mobile, Ala., March 1, 1871.

ANDREW, JOHN ALBION, LL.D. (1818-67). An American statesman, "war Governor" of Massachusetts. He was born in Windham, Me., graduated at Bowdoin in 1837, was admitted to the Boston bar in 1840, practiced there 20 years, and took a prominent part in the cases which arose under the Fugitive Slave Law. In 1858 he was a member of the Legislature and in 1860 was a delegate in the Republican Na-

tional Convention and was elected Governor of Massachusetts by the largest popular majority ever given to a candidate. He foresaw the danger of civil war and took immediate steps to perfect the organization of the militia of his State. Within a week after the first call for troops he sent forward five infantry regiments, a battalion of riflemen, and a battery of artillery. In 1861, and yearly until he insisted on retiring in 1866, he was reelected Governor, and was probably the most efficient of all the "war Governors," continually organizing militia companies and lending aid in every possible way to the Administration. He was at the conference of loyal Governors at Altoona, Pa., in September, 1862, and wrote the address presented by them to the President. He obtained permission from the Secretary of War in January, 1863, to organize colored troops, raised the first colored regiment (the Fifty-fourth Massachusetts Infantry) which participated in the war and sent it to the front early in May. After the war he contended for a policy of conciliation and vigorously opposed all measures likely to humiliate the South. In religion he was Unitarian and presided at the first national conference of that denomination in 1865. He declined the presidency of Antioch (Ohio) College, which was offered to him in 1866. After that time he continued the practice of law in Boston. Consult Chandler, *Memoir, With Personal Reminiscences* (Boston, 1880).

ANDREW, SAINT, OF THE THISTLE. See THISTLE, ORDER OF.

ANDREW, SAINT, THE RUSSIAN ORDER OF. The most distinguished order in the Russian Empire. It was founded on Dec. 10 (N. S.), 1698, by Peter the Great, and membership in it is confined to members of the imperial family, princes, generals-in-chief, and those of similarly high rank. Grand dukes become Knights of St. Andrew at baptism, and other imperial princes upon obtaining their majority. Membership in St. Andrew's carries with it rights to the important orders of St. Anne, Alexander Nevski, and St. Stanislaus. The badge of the order of St. Andrew is a double spread eagle surmounted by the Russian crown. On the obverse of the medal is an enameled cross upon which is borne the figure of St. Andrew, and at the four corners of the cross are the letters S. A. P. R. (*Sanctus Andreas Patronus Russiae*). On the reverse of the badge is the inscription (in Russian) "For Faith and Loyalty." See ORDERS.

ANDREWS, LANCELOT (1555-1626). An eminent English prelate. He was born in London, Sept. 25, 1555, and educated successively at the Coopers' Free Grammar School, Ratcliffe, Merchant Taylors' School, London, and Pembroke Hall, Cambridge, of which college, after having greatly distinguished himself by his industry and acquirements, he was in 1576 elected a fellow. On taking orders, 1580, he accompanied the Earl of Huntingdon to the North of England. His talents attracted the notice of Walsingham, Queen Elizabeth's Secretary of State, who appointed him successively, in 1589, to the vicarage of St. Giles, Cripplegate, a prebendary and canon residentiary of St. Paul's, a prebendary of the Collegiate Church of Southwell, and master of Pembroke Hall. The Queen next testified her esteem for his gifts and piety by appointing him one of her chaplains in ordinary and Dean of Westminster. He rose still higher in favor with King James, who was well

qualified to appreciate his extensive learning and peculiar style of oratory. He attended the Hampton Court Conference, as one of the ecclesiastical commissioners, and took part in the translation of the Bible. The portion on which he was engaged was the first 12 books of the Old Testament. In 1605 he was consecrated Bishop of Chichester. In 1609 he was translated to the see of Ely, and appointed one of his Majesty's privy councilors both for England and Scotland. To the latter country he accompanied the King in 1617, as one of the royal instruments for persuading the Scotch of the superiority of episcopacy over presbytery. In 1619 he was translated to Winchester. He died in Winchester House, Southwark, London, on Sept. 25, 1626. Bishop Andrewes was, with the exception of Ussher, the most learned English theologian of his time. As a preacher he was regarded by his contemporaries as unrivaled; but the excellent qualities of his discourses are apt to suffer much depreciation in modern judgment from the extremely artificial and frigid character of the style. His principal works published during his life were two treatises in reply to Cardinal Bellarmine, in defense of the right of princes over ecclesiastical assemblies. His other works consist of sermons, lectures, and manuals of devotion. Bishop Andrewes was the most eminent of that Anglican school in the seventeenth century of which the nineteenth witnessed a revival under the name of Puseyism. Its distinctive peculiarities were high views of ecclesiastical authority, and of the efficacy of sacraments, ceremonies, and apostolic succession, and extreme opposition to Puritanism. His works are in the Library of Anglo-Catholic Theology, 11 vols., Oxford, 1841-54. Of most fame are his *Devotions* (many editions, London, 1898); *Seventeen Sermons on the Nativity* (1887). For his life, consult Whyte (Edinburgh, 1896), M. Wood (New York, 1898), and Ottley (Boston, 1894).

ANDREWS, CHARLES MCLEAN (1863-). A prominent American historian, born at Wethersfield, Conn. He was educated at Trinity College, and was chosen to a chair of history successively at Byrn Mawr College (1889), Johns Hopkins University (1907), and Yale University (1910). He became a member of the public archives commission, and of the committee on documentary publications of the United States government. His publications include: *Historical Development of Modern Europe* (1898); *A History of England for Schools and Colleges* (1903); *Colonial Self-Government* (1904); *Short History of England* (1912); *The Colonial Period of American History* (1912); *Guide to American Materials in the British Archives* (vol. i, 1898; vol. ii, 1912).

ANDREWS, CHRISTOPHER COLUMBUS (1829-). An American soldier and diplomat. He was born in Hillsboro, N. H., but lived chiefly in Minnesota after 1856. During the Civil War he rose to the regular rank of brigadier-general and at its close was brevetted major-general. He was United States Minister to Sweden from 1869 to 1877, and United States Consul-General to Brazil from 1882 to 1885. His publications include a *History of the Campaign of Mobile* (1867) and *Brazil, Its Condition and Prospects* (1887; 3d ed., 1895).

ANDREWS, EDMUND, M.D., LL.D. (1824-1904). An American surgeon, born at Putney, Vt. He studied medicine at the University of

Michigan, where he was afterward made professor of comparative anatomy. In 1856 he removed to Chicago. He was one of the founders of the Chicago Medical College, which at present forms the medical department of the Northwestern University of Chicago. Dr. Andrews was a surgeon during the Civil War, and, in later life, consulting surgeon to several Chicago hospitals. He introduced a number of valuable improvements into the practice of his profession and published a work on rectal surgery.

ANDREWS, EDWARD GAYER, D.D., LL.D. (1825-1907). An American clergyman; appointed bishop of the Methodist Episcopal Church in 1872. He was born at New Hartford, N. Y., and after graduating at Wesleyan University, Conn. (1847), entered the Methodist Episcopal ministry (1848). In 1854 he became president of Mansfield Female College in Ohio, and for the eight years following was at the head of Cazenovia Seminary. He served as pastor at Stamford, Conn., and Brooklyn, N. Y., from 1864 to 1872, after which he spent many years visiting foreign missions. Bishop Andrews delivered the address at the state funeral of President McKinley in Washington, Sept. 17, 1901.

ANDREWS, ELISHA BENJAMIN, D.D., LL.D. (1844—). An American educator, born at Hinsdale, N. H. He served in Connecticut regiments during the Civil War. Graduating at Brown University in 1870 and at the Newton Theological Institution in 1874, he preached for one year and then was president of Denison University, 1875-79. He was professor of homiletics at Newton Theological Institution, 1879-82; professor of history and political economy in Brown University, 1882-88; professor of political economy and finance in Cornell University, 1888-89, and president of Brown University, 1889-98. He resigned as president of Brown in 1897 because of criticism by trustees of his advocacy of free silver, but at that time withdrew his resignation. He was superintendent of schools, Chicago, 1898-1900, and then became chancellor of the University of Nebraska. In 1892 he was a United States commissioner to the Brussels monetary conference and was a strong supporter of international bimetallism. He became a member of the corporation of Brown University in 1900 and was made president of the Association of State Universities in 1904. He retired from the University of Nebraska as chancellor emeritus Jan. 1, 1909. He has published many college textbooks on history and economics; also, *An Honest Dollar* (1889; 3d ed., 1894); *Wealth and Moral Law* (1894); *History of the United States* (2 vols., 1894); *The History of the Last Quarter Century in the United States, 1870-95* (1896; revised under the title *The United States in Our Own Time*, 1903).

ANDREWS, ETHAN ALLEN (1787-1858). An American educator. He was born in Connecticut, and graduated at Yale in 1810. He practiced law for several years, then (1822-28) was professor in the University of North Carolina, after which he taught in New Haven and Boston. He published a number of Latin text-books and in 1850 a Latin-English lexicon, based on Freund, and with Solomon Stoddard, a Latin grammar, long very popular. The lexicon went through many revisions and came to be known as *Harper's Latin Dictionary* (1907). A monograph, *Slavery and the Domestic Slave Trade in*

the United States, was printed in Boston in 1836. Consult Hubbard Winslow, *Eulogy on the Late Professor E. A. Andrews* (Boston, 1858).

ANDREWS, ETHAN ALLEN (1859—). An American biologist, born in New York City. He received the degree of Ph.B. from Yale University in 1881 and of Ph.D. from Johns Hopkins in 1887, having in the mean time taken post-graduate studies at Yale, at the Polytechnicum of Hanover, Germany, and, as a fellow, at Johns Hopkins. Appointed assistant professor of biology in the last-named university in 1887, he was made associate professor in 1892 and professor of zoölogy in 1908. He became a member of several scientific societies, and in 1904 was president of the Society of American Zoölogists. He contributed on biological subjects to various journals.

ANDREWS, GEORGE LEONARD (1828-99). An American soldier. He was born in Bridgewater, Mass., and in 1851 graduated at West Point at the head of his class. For two years (1854-56) he was assistant professor of engineering at West Point. He then resigned from the service and was engaged in engineering work until the beginning of the Civil War, when he entered the Union Army as lieutenant-colonel. He served in the Shenandoah valley in 1861, took part in Pope's campaign in 1862, was raised to the rank of brigadier-general in November, 1862, and bore a prominent part in General Banks's expedition to New Orleans. He was commander of the Corps d' Afrique from 1863 to 1865, and for "faithful and meritorious services in the campaign against Mobile" was brevetted major-general of volunteers in March, 1865. He was United States marshal in Massachusetts from 1867 to 1871, and was professor of French at West Point from 1871 to 1882, and of modern languages from 1882 until his retirement in 1892.

ANDREWS, LOREN (1819-61). An American educator and sixth president of Kenyon College. He was born in Ashland Co., Ohio, and was educated at Kenyon College. He took an active interest in the common schools, and it is said that much of the present excellence of the Ohio school system is due to him. His administration at Kenyon College was also very successful. At the beginning of the Civil War President Andrews raised a company in Knox County and was made captain. Afterward, as colonel of the Fourth Ohio Volunteers, he saw severe service in Virginia. He died of camp fever while in active service.

ANDREWS, LORRIN (1795-1868). An American educator. He was born in East Windsor, Conn., educated at Jefferson College and Princeton Theological Seminary, and went as missionary to the Sandwich Islands in 1827. In 1831 he founded what became the Hawaiian University, in which he was professor. He was long privy councillor and judge under the native government. He wrote an Hawaiian dictionary and published part of the Bible in that tongue.

ANDREWS, SAINT. See SAINT ANDREWS.

ANDREWS, SAINT. UNIVERSITY OF. See SAINT ANDREWS, UNIVERSITY OF.

ANDREWS, SAMUEL JAMES (1817-1906). An Irvingite divine. He was born at Danbury, Conn., July 31, 1817; graduated at Williams College, 1839; practiced law for some years, but turned his attention to theology, and was a Congregational clergyman from 1848 to 1855. In 1856 he became pastor of the Catholic and Apos-

tolie Church (Irvingite) at Hartford, Conn. His publications embrace: *Life of Our Lord upon the Earth, Considered in its Historical, Chronological, and Geographical Relations* (New York, 1863; new and wholly revised ed., 1891); *God's Revelations of Himself to Men* (1885); *Christianity and Anti-Christianity in their Final Conflict* (1898); *The Church and its Organic Ministry* (1899); *William Watson Andrews: A Religious Biography* (1900).

ANDREWS, STEPHEN PEARL (1812-86). An eccentric writer, and the originator of a system of stenographic reporting. He was born in Templeton, Mass., studied for the bar, and became involved in the abolition agitation, for which he undertook a mission to England. While there he learned phonography, and on his return to America devised a popular system of phonographic reporting. To further this he published a series of instruction books and edited two journals, the *Anglo-Saxon* and the *Propagandist*. He was a remarkable linguist, but an erratic scholar and writer. He devised a "scientific" language, "Alwato," in which he was wont to converse and correspond with pupils. At the time of his death he was compiling a dictionary of it, which was published posthumously.

ANDREWS, THOMAS (1813-85). An Irish chemist and physicist, born at Belfast. He studied medicine and the physical sciences at Glasgow, Paris, Edinburgh, and Dublin. After practicing medicine for several years in his native city, he became, in 1845, professor of chemistry at Queen's College, which position he resigned in 1879. Andrews carried out a number of important researches on the heat developed during various chemical transformations and on the nature of ozone. His most important contribution to science, however, was the discovery (1861) of the continuity of the liquid and gaseous states. He was the first to find that for every gas there is a temperature (called the critical temperature) above which the gas cannot be liquefied, no matter how great the pressure exerted upon it. Below that temperature the gas may be partly liquefied, gas and liquid being separated by the surface of the latter. Precisely at the critical temperature, however, the surface of separation disappears, and the substance enters into a homogeneous state, combining the properties both of the liquid and the gaseous states. This continuity of states has led to an attempt to extend to liquids the laws of gases and thus to establish a relationship between the properties of matter in the two states. This attempt, however, has been only partially successful. See CRITICAL POINT; MENDELÉEFF.

ANDREWS, WILLIAM DRAPER (1818-96). An American inventor. He was born at Grafton, Mass. In 1844 he invented the centrifugal pump, which made it possible to save from abandoned wrecks goods not injured by water. This pump, patented here in 1846, was manufactured in England as the Gwynne pump. Afterward he invented and patented an anti-friction centrifugal pump, made various modifications of the centrifugal pumps, of which the "Cataract" was the most important, and patented a widely used system of gangs of tube wells. His pumps were used on the monitors in the Civil War, and employed in the deepening of the Mississippi River. In 1885 the water supply of Brooklyn was increased by the use of the Andrews gang wells.

ANDREWS, WILLIAM WATSON (1810-97). An American clergyman of the Catholic Apostolic church. He was born at Windham, Windham Co., Conn., graduated in 1831 at Yale, and in 1834 was ordained and installed pastor of the Congregational church at Kent, Conn. He early accepted the tenet of the Catholic Apostolic church, commonly spoken of as the "Irvingites," and in 1849, having given up his charge at Kent, he assumed charge of the Catholic Apostolic congregation in Potsdam, N. Y. He subsequently made his home in Wethersfield, Conn., and traveled much in the Eastern and Middle States as evangelist. Among the congregations established under his direction was one organized at Hartford in 1868. He was an eloquent preacher and a clear and forceful writer. He contributed articles on the Catholic Apostolic church to the *Bibliotheca Sacra* and McClintock and Strong's *Cyclopædia*, prepared for the *Life of President Porter* a chapter on Dr. Porter as "A Student at Yale," and published many reviews, orations, sermons, and addresses, and *The Miscellanies and Correspondence of Hon. John Cotton Smith* (1847). Consult Andrews, *William Watson Andrews: A Memorial* (New York, 1900).

ANDRIA, än'drê-à. An episcopal city in Apulia, south Italy, 5 miles from Barletta and 31 miles west of Bari, with both of which it is connected by a street railway (Map: Italy, L 6). The chief trade is in almonds, for which the country is famous, olives, grain, cattle, and majolica. Andria was founded about 1050 and was a favorite residence of Emperor Frederick II in the thirteenth century. Nine miles south of the city he built the imposing Castel del Monte, having several beautiful Gothic windows, and still well preserved. Pop., 1901 (commune), 49,569; 1911, 53,274.

AN'DRIA. The earliest extant comedy of Terence, adapted in 166 B.C. from the *Andria* of Menander. It deals with the experiences, at Athens, of a girl from Andros.

ANDRIEUX, än'drê-ê', FRANÇOIS GUILLAUME JEAN STANISLAS (1759-1833). A French dramatist and idyllic poet, born at Strassburg. He took an active part in the Revolution, was of the Council of the Five Hundred (1798), professor in the Polytechnic School (1803), in the Collège de France (1814), member of the French Academy (1816), and its perpetual secretary (1829), collaborating actively in its *Dictionary*. He also wrote several comedies, of which the best is *Molière avec ses amis* (1804); a tragedy, *Brutus* (1794), and poems distinguished for purity of prosody and diction. Of these, *Le meunier de Sans-Souci* (1797) is still remembered, and was paraphrased by Luise Mühlbach. As a lecturer he was singularly attractive.

ANDRIS'CUS (Gk. 'Ανδρίσκος, *Andriskos*). A fuller of Adramyttium, who pretended to be the son of Perseus, King of Macedonia, and assumed the name Philip. He was seized, sent to Rome, and imprisoned; but escaped, and in 149 B.C. defeated the prætor Juventius in battle. He reigned as a cruel and oppressive tyrant for about a year, but was finally conquered in 148 B.C. by Quintus Cæcilius Metellus and again taken to Rome, where he was put to death.

AN'DROCLUS (Aulus Gellius, v, 14), or **ANDROCLES** (Ælian, vii, 48). The slave of a Roman Consul of the Early Empire, who compelled him to fight with a ferocious lion in the Circus Maximus. The beast, far from hurting

him, fondled him like a playful dog. When the Emperor and the people demanded an explanation of such strange actions, Androclus explained that he had escaped from a cruel master in Africa and had taken refuge in a desert cave. One day, a lion entered the cave limping painfully and holding up his paw, from which Androclus extracted a large thorn. The grateful beast never forgot this, and when they met again in the Circus at Rome he testified his recognition. Both slave and lion were freed and afterward were exhibited in the streets of Rome.

ANDROGYNOUS, ăn-drōj'ī-nūs. See FLOWER; REPRODUCTION.

ANDROMACHE, ăn-drōm'ă-kē (Gk. Ἀνδρομάχη, *Andromachē*). The wife of Hector and mother of Astyanax, daughter of King Eëtion of Asiatic Thebes. Her father and seven brothers were killed by Achilles, and from that time she clung to Hector with a love whose tenderness and pathos are beautifully depicted in Homer's *Iliad*, especially in her parting with her husband (book vi), and her lament over his body (book xxiv). At the capture of Troy her son was dashed from the walls, and she became the prize of Neoptolemus, son of Achilles, to whom she bore a son, Molossus. Afterward she was the wife of Helenus, Hector's brother, to whom she bore Cestrinus. Her danger from the jealousy of Hermione, wife of Neoptolemus, is the subject of a tragedy by Euripides. See HECTOR; TROJAN WAR.

ANDROM'ACHE. A tragedy by Euripides (q.v.), written probably during the Peloponnesian War, as it contains many unfriendly allusions to Sparta. Its subject is the part of the legend of Andromache in which she is with Neoptolemus, her second husband.

ANDROMAQUE, ăn'drō'măk'. 1. A tragedy by Racine (1667), founded on the classical legend. The story is adapted from Racine in Phillips's play *The Distressed Mother* (1712). 2. An opera by Grétry, presented at Paris in 1780.

ANDROM'EDA (Gk. Ἀνδρομέδη, *Andromedē*). Daughter of the Ethiopian King Cepheus and Cassiopeia. Like her mother, she was remarkably beautiful. When Cassiopeia boasted that her daughter was more beautiful than the Nereids, the latter prayed Poseidon to avenge the insult. Accordingly the territory of Cepheus was devastated by a flood, and a sea-monster appeared, whose wrath, the oracle of Ammon (q.v.) declared, could be appeased only by the sacrifice of Andromeda. Andromeda was fastened to a rock near the sea and left as a prey to the monster; but Perseus, returning from his victorious battle with Medusa, saw the beautiful victim, slew the monster, and received Andromeda as his reward. Our versions of this legend seem largely due to a tragedy by Euripides, which ended with a prophecy by Athena that all concerned would be placed among the stars.

ANDROMEDA. A genus of plants of the family Ericaceæ, represented by a single species, *Andromeda polifolia*, wild rosemary. It is a small evergreen shrub with beautiful rose-colored drooping flowers, is occasionally found in peat bogs in different parts of Great Britain, and common throughout the north of Europe and North America. It has acrid narcotic properties, and sheep are sometimes killed by eating it. The shoots of a closely related genus in like manner poison goats in Nepal, and similar effects are ascribed to the stagger-bush (*Lyonia*

mariana or *Neopieris mariana*) and other related species in the United States.

ANDROMEDA. A large constellation of the northern hemisphere situated just south of Cassiopeia and west of Perseus. It contains no stars of the first magnitude, but is noted for its Great Nebula, the brightest of all the nebulae. In August, 1885, the heart of this nebula was the scene of the outburst of a remarkable *nova*, or temporary new star, which, after increasing in brilliancy from the ninth to the seventh magnitude in less than a month, faded rapidly until, in the following March, it was beyond the range of the most powerful telescopes.

AN'DRONI'CUS. The name of three Byzantine emperors.—ANDRONICUS I (c.1110–85) was the son of Isaac Comnenus. His life was full of vicissitudes. During part of his youth he was a prisoner of the Turks in Asia Minor. He afterward spent some time at the court of his cousin, the Emperor Manuel, and a niece of the Emperor became his mistress. He was appointed to a military command in Cilicia; but, although the favorite of the army, his imprudence and waste of time in dissolute pleasures involved him in defeat. Having engaged in a treasonable correspondence with the King of Hungary and the German Emperor, he was thrown into prison by Manuel, and remained there more than 12 years. At last he succeeded in making his escape and reached Kiev, the residence of Prince Yaroslav. He regained the favor of his cousin by persuading the Russian Prince to join in the invasion of Hungary, but incurred his cousin's displeasure again by refusing to take the oath of allegiance to the Prince of Hungary, the intended husband of Manuel's daughter, as presumptive heir to the Empire. He was sent in honorable banishment to Cilicia, but soon fled to Antioch, where he found a new mistress in a sister of the Empress. The resentment of the Emperor breaking out against him, he sought refuge in a pilgrimage to Jerusalem. His professions of zeal caused his former conduct to be forgotten, and he was invested with the lordship of Berytus (now Beirut); but his profligacy became, if possible, more scandalous than ever. He seduced Theodora, the widow of Baldwin, King of Jerusalem, who lived with him for years as his mistress. The Emperor's anger made the Syrian coast unsafe for him, and he fled with Theodora to Damascus, and finally settled down among the Turks in Asia Minor, with a band of outlaws, making frequent inroads into the Roman province of Trebizond, from which he carried away spoil and slaves. Theodora and her children were at last taken and sent to Constantinople, and thither he followed, imploring the forgiveness of the Emperor, which he obtained; but he was sent to Cenoë, in Pontus. After the death of Manuel popular indignation was excited against the Empress, who acted as regent for her son, Alexius II, and Andronicus was recalled, in 1182, to deliver the Empire from her tyranny. He was appointed guardian of the young Emperor, and soon after his colleague in the Empire. He caused the Empress-mother to be strangled, and afterward Alexius himself, whose widow he married. His reign, though short, was vigorous and restored prosperity to the provinces; but tyranny and murder were its characteristics in the capital. He set no bounds to the gratification of his revenge against all who had ever offended him, and his jealousy of possible rivals was equally sanguine.

nary. At last, a destined victim, Isaac Angelus, one of his relatives, having fled to the church of St. Sophia for sanctuary, a crowd gathered, and a sudden insurrection placed Isaac on the throne, while Andronicus was put to death by the infuriated populace, after horrible mutilations and tortures, on Sept. 12, 1185. He was the last of the Comneni that sat on the throne of Constantinople; but the succeeding dukes and emperors of Trebizond were descendants of his son, Manuel. See Diehl, *Figures Byzantines*, vol. ii (Paris, 1909).—ANDRONICUS II (1260–1332), the son of Michael Palæologus, ascended the throne in 1282; but, after a weak and inglorious reign, was driven from it, in 1328, by his grandson.—ANDRONICUS III (c.1296–1341), after a reign equally inglorious, died in 1341. Consult Gibbon, *Decline and Fall of the Roman Empire*, edited by Bury.

ANDRONICUS (Gk. Ἀνδρόνικος, *Andronikos*), also called CYRRHESTES, from his birth-place, Cyrrhus, in Syria. A Greek architect, who erected the so-called Tower of the Winds at Athens, a building 42 feet high and 26 feet in diameter, dating from the first century B.C. This tower was an octagonal structure, made of Pentelic marble and surmounted by a figure of Triton, which moved with the wind and pointed with a staff to the direction from which the wind came. On the eight sides of the tower, near the top, were sculptured in relief symbolical figures representing the eight principal winds, and beneath these, on the sides which caught the sun, were sun-dials. The interior contained a water-clock. It was repaired in later ages and is still standing in excellent preservation. It stands to the north of the Acropolis, in the district which, under the Romans, became the centre of commercial life at Athens. In the Middle Ages this structure was called "The Lantern of Demosthenes." See E. A. Gardner, *Ancient Athens* (New York, 1902).

ANDRONICUS OF RHODES. A Greek peripatetic philosopher, who lived at Rome in Cicero's time and employed himself in arranging, criticising, and explaining the works of Aristotle, which for some time had been neglected; a great number of these works he was probably the means of preserving to us. He gave to the Peripatetic school a new bent, the philological. None of the writings of Andronicus is extant; a work *On the Passions*, attributed to him, is a compilation of the Roman imperial period; a paraphrase of the Nicomachean Ethics is the work of Constantine Palæocappa of the sixteenth century. Consult, in general, Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (Leipzig, 1891–92).

ANDRONICUS, LIVIUS. See LIVIUS ANDRONICUS.

ANDRONICUS, TITUS. The hero of the Shakespearean play *Titus Andronicus*.

ANDROPH'ILUS (Gr. *andro-philos*, a lover of mankind). The personification of philanthropy in Phineas Fletcher's *Purple Island*, published in 1633.

AN'DROPO'GON (called so from the bearded male flowers, from the Gk. ἀνήρ, *anēr*, man + πώγων, *pōgōn*, beard). A cosmopolitan genus of grasses, including about 150 species, the relative merits of which vary widely. Some are highly prized for hay and pasturage, as *Andropogon halepense*, or Johnson grass, which has

been under cultivation in the United States since about 1830. It yields large quantities of hay, and in Southern States may be cut three or four times a year. On account of its habit of growth—it spreads by its rhizomes—when once established it is difficult of eradication. It is somewhat sensitive to cold and will not persist as a perennial except in warm regions. Recent investigations have shown that Johnson grass, if fed green, is sometimes poisonous to stock. The poisonous action is said to be due to a compound yielding hydrocyanic acid which disappears in ripening or drying. Other species of *Andropogon* are believed to possess this same property. A grass resembling Johnson grass but without its spreading root-stocks has been recently introduced into the United States under the name Sudan grass. It is a native of Sudan, but the grass has met with favor as a drought-resistant hay plant. It is believed to be a variety of *Andropogon sorghum* mentioned below. A number of species of *Andropogon* are well known in the semi-arid region of the United States under the name of blue-stem grasses, and in these regions are of value. The principal of these species are: *Andropogon nutans*, *Andropogon provincialis*, and *Andropogon scoparius*. Other species are known in the eastern and southern parts of the United States as broom sedge; of these *Andropogon virginicus* is one of the most widely distributed. If cut early, the broom sedges make good hay; but if left too long, the plant becomes so woody as to be refused by all stock. In some systems of classification the sorghums are grouped under this genus. The specific name *Andropogon sorghum* and its variety, *sativus*, comprise under these classifications the saccharine and non-saccharine forms. Among the latter are durra, Millo maize, kaoliang, Kafir corn, Jerusalem corn, broom corn, etc., some of which are valuable for forage in dry countries. Eight or ten species are considered of economic importance in Australia. Two tropical species are widely known, the lemon grass (*Andropogon schænanthus*) and *Andropogon nardus*, sources of lemon oil and citronella oil, both of which are largely used in making perfumery.

AN'DROS (Gk. Ἄνδρος). One of the islands of the Greek archipelago, the most northerly of the Cyclades, separated from Eubœa by the Doro channel, 6 miles broad (Map: Greece, F 4). The island is 25 miles long, about 9 miles in its greatest breadth, and covers a total area of about 160 square miles. It is traversed by several mountain chains, separated from one another by deep valleys, which yield grain, olives, and other southern fruits and common vegetables. Domestic animals are raised extensively in the northern part, which is inhabited chiefly by Albanians. The chief towns are Gavriion, the best port, Korthion and Andros, the capital. The last mentioned carries on a large trade, is the seat of Greek and Roman Catholic bishops, and has a population (1907) of 8536. The island was originally settled by pirates and subsequently by Ionians. It was successively in the hands of the Athenians, Macedonians, and Romans, and, in 1207, had a prince of its choosing, the Venetian nobleman Marino Dandolo. In 1566 it fell into the hands of the Turks, whose rule, however, was chiefly restricted to the levying of an annual tribute of 30,000 piasters. At present the island forms a part of Greece. Pop., 1907, 18,035. Consult Kopf, *Geschichte der Insel Andros* (Vienna, 1855).

ANDROS, Sir EDMUND (1637-1714). A Colonial Governor in America, the son of an officer in the English royal household. In 1674 he was sent to America as Governor of the Colony of New York, and to him Sir Anthony Colve, the Governor during the temporary Dutch supremacy, surrendered without forcible opposition. His commission gave him jurisdiction over Long Island, Pemaquid, and the region between the Connecticut River and the Delaware River. He was thus brought into embarrassing relations with the proprietary government of East Jersey and also became engaged in controversies with the authorities of Connecticut. After the charters of the New England provinces had been declared forfeited by the English courts, the policy of the English administration in furtherance of a strongly centralized colonial system was illustrated by the steps taken to consolidate the lands of New England into one province, the Dominion of New England, over which, in 1686, Andros was made Governor-General with large powers. He was to admit religious toleration, but could suppress all printing, name and change his council at will, and, with their consent, levy taxes and control the militia. When Connecticut refused to recognize his authority, he appeared in the council chamber at Hartford, in October, 1687, with an armed guard, and demanded the surrender of the colony's charter. There long survived a tradition of the hiding of the charter in an oak tree. The leaders, both in Connecticut and in Rhode Island, deemed it prudent to render perfunctory obedience to the one in forcible control of the political situation. In 1688 New York and New Jersey were attached to New England, and Andros's rule was extended over all territory between the St. Croix and the Delaware. On hearing of the revolution in England, the people of Boston imprisoned Andros and some of his officers, April 18, 1689, and Leisler set up a rebel government in New York. In July Andros and a committee of accusers were ordered to England, but the charges were never pressed to a formal trial. The accession of William III made possible the undoing of the work of Andros. The charters of Connecticut and Rhode Island were recognized as in force. Massachusetts received from the King a new charter, and New Hampshire was organized as a distinct royal province. In 1692 Andros came back as Governor of Virginia, where he was popular, retiring in 1698, and acting as Governor of Guernsey, 1704-06. In 1691 he published an account of his proceedings in New England. Whitmore (ed.), *Andros Tracts; with notes and memoir* (Prince Society Publications, Boston, 1868-74). The character of Andros is not viewed as it once was by Americans. The changed view can be found set forth, though not impartially, in Ferguson, *Essays in American History* (New York, 1894).

AN'DROSCOG'GIN. A river rising in Umbagog Lake, which lies on the State lines of New Hampshire and Maine. It is 157 miles long and flows through both States, emptying into the estuary of the Kennebec above Bath (Map: Maine, B 7). Its value for navigation is small, but as the elevation of its source at Lake Umbagog is over 2000 feet, and as the descent is abrupt at many places, until at Auburn, Me., the elevation is but 210 feet, it affords extensive power to the many industries established on its banks.

ANDRO'TION (Gk. Ἀνδροτίων). A Greek

orator, praised by Demosthenes and Aristotle, contemporary with Demosthenes, and pupil of Isocrates. When he moved that a crown be presented to the Council of Five Hundred at the expiration of their term of office, he was charged with making an illegal proposal; Demosthenes wrote a speech for one of the accusers, which we still have. He went into exile at Megara, and wrote there, it is said, an annalistic account of Athens from the earliest times, called *Atthis*.

ANDROUET DU CERCEAU, äN'drō'ä' du sâr'sö'. A famous family of French architects of the sixteenth and seventeenth centuries, founded by Jacques Androuet (c.1510-84), called du Cerceau from the circle used as the sign over his workshop. Jacques was one of the leaders in introducing the Italian Renaissance style into France through his works, his writings, and his numerous drawings. He is best known by his *Les Plus Excellens Bastimens de France* (1576-79) and other collections of engravings. He was succeeded by his two sons, Baptiste (c.1544-1602) and Jacques II (died 1614), who took part in many of the great constructions of the time in France, such as the Louvre, the Tuileries, the Pont Neuf, St. Denis (chapel), etc. The third generation was represented by Baptiste's son, Jean (c.1600-16), chiefly noted for the private palaces he built in Paris, such as the Sully and Bellegarde mansions.

ANDRYANE, äN'drë'an', ALEXANDRE PHILIPPE (1797-1863). A French soldier noted for his captivity in the fortress of Spielberg. He was born in Paris, and after serving as an artillery officer until 1815, went to Italy and attempted to incite an insurrection against Austria. He was arrested and condemned to death, but his sentence was commuted by the Emperor of Austria to perpetual imprisonment in the fortress of Spielberg, where for eight years he led a life of torture, vividly described in his *Mémoires d'un prisonnier d'état* (Paris, 1837-38; Eng. trans. by Fortunato Prandi, London, 1848). He was pardoned in 1832 and afterward served with the French army in Italy. After the battle of Magenta he was appointed commissary-general by Napoleon III. In addition to the before-mentioned work he published *Souvenirs de Genève, complément des mémoires d'un prisonnier d'état* (1839).

ANDÚJAR, äN-dōō'här. A town of Andalusia, Spain, in the province of Jaen, 24 miles north-northwest of Jaen, on the right bank of the Guadalquivir, at the base of the Sierra Morena (Map: Spain, C 3). It stands on the highroad at the head of a pass over the Sierra Morena. It is a flourishing town, with fine churches, four nunneries, six monasteries, three hospitals, and a theatre. A promenade extends through the town. There is trade in grain, cattle, pottery, and wine. Alcarrazas, porous stone jars for cooling water, are made here. Andújar is frequented for the mineral springs in its neighborhood. Pop., 1900, 16,302; 1910, 16,499.

ANDVARI, äN-dvä'rë. In Norse mythology, the name of the fish-shaped dwarf who owned the ring, on which he cast the curse of ill-obtained gold, fatal to the possessor. This is the keynote of the remarkable stories of Sigurd Fafnisbane and the German legends presented in musical form by Wagner in an elaborate tetralogy, consisting of *Das Rheingold* (the temptation), *Die Walküre* (Fate), *Siegfried* (the hero), and *Die Götterdämmerung* (the 'Twilight of the Gods,' or end of all things).

AN'ECNOTE (Gk. ἀνέκδοτος, *anekdotos*, unpublished, from ἀν, *an*, negat. + ἐκ, *ek*, out + διδόναι, *didonai*, to give). Procopius called his secret history of Justinian's court *Anecdota*. The name is applied also to portions of ancient writings long unpublished, and a number of such *Anecdota* have been collected in volumes and printed. It ordinarily means some isolated fact, usually of a personal nature, calculated to interest a listener. There are a great many books of anecdotes, the most celebrated in English being the *Percy Anecdotes*. See Hood, *World of Anecdote* (4 vols., Philadelphia, 1901).

ANEGADA, ä'nä-gä'dä (or 'Drowned Island'). The most northerly of the Virgin Islands, belonging to Great Britain (Map: Antilles, F 3). It is in lat. 18° 45' N., long. 64° 20' W., is 12 miles long, and very narrow. The famous Horseshoe Reef surrounds it, and the surf breaks over a great part of the island during a rough sea. The raising of goats and sheep and the production of salt is the occupation of the small number of inhabitants. It is believed that there are mineral deposits, but they have never been exploited.

ANEL, DOMINIQUE (c.1679–c.1730). A French surgeon. He invented a syringe for treatment of *fistula lachrymalis*, but is especially known for his new method of operating for aneurism by ligature of the artery above the swelling, the method later perfected by Hunter. His writings include: *L'art de sucer les playes sans se servir de la bouche d'un homme* (1707); *Nouvelle méthode de guérir les fistules lacrymales* (1713); *Traité de la goutte* (1713).

ANEL'IDA AND AR'CITE. A poem by Chaucer, called also *Queen Anelida and False Arcite*. Anelida is an Armenian queen; Arcite a knight of Thebes. The work is unfinished, but was printed by Caxton. Parts of it have been recognized as taken from Statius's *Thebaid* and Boccaccio's *Teseide*. Chaucer himself acknowledged obligation to Statius and Corinna, a Greek poetess of the fifth century B.C. There is a modern version by Elizabeth Barrett Browning.

ANEM'OGRAPH (Gk. άνεμος, *anemos*, wind + γράφειν, *graphcin*, to write, record). When a wind vane actuates mechanisms connected thereto so as to write a record of its changes of position upon a sheet of paper moved at a uniform rate by clockwork, the apparatus is called an anemograph. In some cases the travel of the wind in miles or feet is also recorded upon the same sheet of paper by an anemometer, but the combined instrument is still called an anemograph. Some instruments record all the shifting positions of the vane and the continuous motion of the anemometer; others show, once each minute, only the instantaneous position of the vane to the nearest one of the eight points of the compass, the travel of the wind being recorded only by whole miles. An instrument of this type is extensively used by the United States Weather Bureau, and since a material amount of rain does not occur simultaneously with sunshine, both these elements also are recorded by one and the same additional pen on the same sheet of paper with the wind. The instrument then becomes a *meteorograph*, but it is popularly called a "triple register" because it comprises three principal recording parts.

AN'EMOM'ETER (Gk. άνεμος, *anemos*, wind + μέτρον, *metron*, measure). An instrument to measure the motion, velocity, or pressure of the

wind by some of the effects it produces. The origin of such instruments is remote and obscure, but Hooke's pendulum anemometer, in which the pressure of the wind is indicated by the deflection of a suspended plate, is mentioned as early as 1667. Anemometers indicating the travel of the wind by the rotation of a wheel or arrangement of vanes began to be used about 1724. The cup anemometer, used at the present time in the United States, England, and elsewhere, was designed by Robinson in 1846 after suggestions by Edgeworth. In very recent times devices for measuring air currents by the electrical energy required to keep a wire heated to a constant temperature when exposed to the wind to be measured, have been suggested by Barus and successfully employed by Thomas in the United States and Morris in England. Many details of the history of anemometers are given by Abbe in his *Metcorological Apparatus and Methods* (Report, Chief Signal Officer, 1887, Washington). Numerous forms and varieties have been worked out, but they may all be grouped in four classes according to the particular effect utilized.

1. Pressure of the wind producing deflection or movement of plates, cylinders, spheres, etc., including bridled anemometers.

2. Pressure and suction of the wind causing difference of level in liquid columns.

3. Pressure of the wind causing rotation of vanes or cups.

4. The cooling of electrically heated wire.

The earliest forms belong in class (1), and the model revived in 1861 by Prof. H. Wild is now used in Switzerland and Russia. In this instrument a plane square tablet is suspended vertically from a horizontal axis which is kept by a wind vane always at right angles to the direction of the wind; the tablet is raised by the wind to an inclined position of temporary rest, and its angular inclination to the vertical is noted on a graduated arc. Cylinders and spheres which do not require to be pointed to the wind have been sometimes used instead of the plate.

Pressure and suction anemometers in their best forms are the same in principle and action as the so-called Pitot tube, employed about 1760 by the engineer of that name, for measuring the flow of water in pipes and channels, and frequently used for the same purpose at the present day. The instrument consists essentially of a column of liquid in a U-tube, one branch of which communicates with a thin-walled, clean-cut tube presented squarely to the wind. The wind thus causes an increase of pressure within this branch, while the other branch is usually connected with an aperture in the side of a smooth tube so disposed that the air flows in undisturbed stream lines directly across the opening. Therefore the pressure of the air within the latter tube is the static pressure of the air in motion. This is the only form of anemometer whose mathematical equation can be written at once from what is known of its theory, viz.,

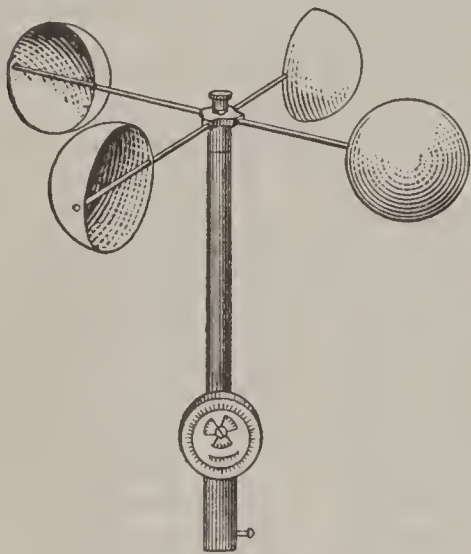
$$v^2 = \frac{2gh}{d}$$

where h is the dynamic pressure as shown by the height of the liquid column, d is the density of the air, and g is the force of gravity.

The Dines pressure-tube recording anemometer, now extensively used in England, is a practical

adaptation of the Pitot tube to produce continuous records and is especially appropriate to the registration of gusts and the continual fluctuation of the wind's force.

Rotation anemometers are those in which the wind sets in motion plane or curved metallic blades. The earliest form resembled that of Dinglinger, mentioned by Leupold in 1724, in that it used the Polish water-wheel with vertical axis, but differed essentially in that Dinglinger prevented the rotation of the arms and measured the pressure required to keep them quiet, whereas d'Ons-en-Bray, in 1734, allowed them to rotate continuously. Since that time two essentially different varieties of the rotation anemometer have been developed, namely, (a) those of Schrober and Woltmann, Combes, Casella, Whewell, or Biram, in all which sets of plane plates inclined to an axis are forced to revolve about it by the wind blowing in the direction of the axis. The name "air meter" is frequently given to anemometers of this form, which are much used in studies on ventilation of mines and buildings. The most important meteorological application of this style is that manufactured by Richard for use at the French observ-



ROBINSON ANEMOMETER.

ing stations. (b) The Robinson anemometer, brought out by Dr. Robinson in 1846, but suggested to him by Edgeworth many years before. This has come into very general use by English and American meteorological observers as the Robinson hemispherical cup anemometer. In this instrument a vertical spindle carries at its upper end four horizontal arms at right angles to each other; each arm carries at its extremity a hollow hemispherical cup of thin sheet metal whose circular rim is in a vertical plane passing through the common vertical axis of rotation of the spindle. The wind rotates these cups so that the convex side of each cup goes forward. Numerous experiments have been made to determine the relation between the velocity of the wind and that of the cups. The instrument makers have generally followed Dr. Robinson's conclusion, that the linear motion of the centre of the cup is one-third of that of the wind; we now know that this is true only for anemometers of certain dimensions, i.e., 4-inch cups on arms 6.72 inches long, and for velocities ranging from about 5 to 15 miles per hour.

The cup anemometer has been experimentally tested on whirling machines and otherwise, at St. Petersburg, at the Deutsche Seewarte in Hamburg, by Dines in England, and by Marvin in the United States. Chree has recently developed a mathematical theory of the instrument that includes a term for the moment of inertia of the revolving system, Marvin's investigations having shown that such a term is necessary. From all these sources of information it is learned that in perfectly uniform winds the general average ratio between the velocity of the wind and that of the cups varies with

the length of the arm and the size of the cups between 2.5 and 3.5, so that it is necessary to determine the ratio by actual experiment upon each respective type of anemometer.

Anemometers with heavy cups, i.e., with a large moment of inertia, when exposed to winds of rapidly changing velocity, will run faster than the same instrument if the moment of inertia of the cups is small. This is because a sudden increase in the wind acts strongly on the concave faces of the cups and quickly increases the velocity of rotation, whether the cups are light or heavy; however, when a sudden lull occurs, their inertia keeps a set of heavy cups in relatively rapid motion for a considerable time, thus falsifying the wind motion, whereas a set of light cups quickly slow down to the proper rate. The standard aluminum cups used by the United States Weather Bureau have a moment of inertia of about 59,000 gr. cm^2 , and extended comparisons show that in the ordinary gusty winds such as occur day by day, the error of indication due to the moment of inertia effect is probably less than 1 per cent of the wind movement.

A new series of investigations by the Weather Bureau are now (1913) in progress, for the purpose of securing tests at velocities up to and beyond 100 miles per hour. At 80 miles per hour the wind velocity is 2.4 times the velocity of the cup centres.

Observations on strong winds on the summit of Mount Washington indicate that the factors used to compute velocities from the anemometer at sea level apply also to that high elevation, so that there is no evidence that the Robinson anemometer is appreciably influenced by changes in the density of the air, notwithstanding that the wind pressures for a given velocity are smaller in proportion to the density.

Hot-wire Anemometer. The hot-wire anemometer is one of the latest forms of anemometer and has been most fully investigated by Prof. J. T. Morris. The apparatus is briefly described by the author as follows: "In its final form the anemometer consists essentially of a small Wheatstone's bridge having two arms of manganin and the other two of platinum. The former material has a negligible temperature coefficient, whilst that of platinum is considerable. The bridge is constructed so that all cold it is out of balance and the current is increased until the temperature rise of the platinum increases the resistance sufficiently to bring the bridge into balance in still air, an operation which gives the zero of the scale. If now the instrument is placed in a current of air, the wires will be cooled—an operation which does not affect the manganin wires, but lowers the resistance of the platinum pair; and to restore the balance the current through the arms of the bridge must be increased. This current is therefore a measure of the velocity of flow." (*Engineering*, vol. 942, p. 892, London, Dec. 27, 1912).

From tests of the anemometer in a wind tunnel Morris found that between small velocities and 40 miles an hour, the velocity of the wind could be represented by an equation of the following form,

$$V = bw^2 - a,$$

where w is the number of watts required to maintain the wire at a constant temperature, and a and b are constants.

ANEMONE, ETC.



1. THE ARETHUSA (*Arethusa bulbosa*).
2. WIND FLOWER (*Anemone nemerosa*).
3. MOORWORT (*Andromeda Polifolia*).

4. BETEL NUT (*Areca Catechu*).
5. FLAMINGO FLOWER (*Anthurium Andraeanum*).
6. POPPY ANEMONE (*Anemone coronaria*).

ANEMONE, *Lat.* ān'ē-mō'nē; *Engl.* ā-nēm'ō-nē (Gk. ἀνεμώνη, the wind-flower, from ἄνεμος, *anemos*, wind), or WIND-FLOWER. (See PASQUE FLOWER.) A genus of plants of about 85 species belonging to the family Ranunculaceæ, and distributed throughout the temperate and subarctic regions of both hemispheres. They are perennial herbs with lobed to dissected basal leaves, those of the stem forming an involucre, petaloid sepals, no petals, and numerous achenes. (See ACHENE.) The name is said to be derived from the fact that many of the species prefer very exposed situations. Most of them flower early in the spring. One species, *Anemone quinquefolia*, the wood anemone, is a common native of all parts of Great Britain and eastern North America, and its white flowers, externally tinged with purple, are an ornament of many a woodland scene and mountain pasture in April and May. Another species, *Anemone pulsatilla*, or *Pulsatilla vulgaris*, the Pasque flower, adorns chalky pastures in some parts of England at the same season. Its flowers are purple and externally silky. *Pulsatilla patens* is called the American Pasque flower and resembles the European species. The garden anemone is a favorite florist's flower; the varieties are very numerous, and whole works have been published on them and their cultivation, which is most extensively carried on in Holland and has prevailed from a very early period. It is generally supposed that all these varieties have originated from two species, which are natives of the Levant. By cultivation the size of the flower is increased, its form and colors are modified, and many of the stamens are often changed into small petals forming a doubled flower. The cultivation of the anemone requires great attention, the plant preferring light soil. The root, which consists of clustered tubers, is taken up after flowering. The plant is propagated by parting the roots or by seed. In the latter way new varieties are obtained. Seedling plants do not flower till the second or third year. Besides the species which have been named, others occasionally appear as ornaments of our flower gardens. The species of this genus are characterized by the acidity prevalent in the family to which they belong, the rhizomes of *Anemone nemorosa* and others having been recommended in cases of obstinate rheumatism and in tania. See Plate ANEMONE, ETC.

ANEMONE, SEA. See SEA-ANEMONE.

AN'EMOPH'ILOUS PLANTS (Gk. ἄνεμος, *anemos*, wind + φίλος, *philos*, loving, friend). Plants whose flowers receive pollen by means of wind, in contrast with entomophilous plants, whose agents of pollination are insects. See POLLINATION.

ANEM'OSCOPE (Gk. ἄνεμος, *anemos*, wind + σκοπεῖν, *skopein*, to look at, consider). A wind vane or other instrument which shows the direction of the wind. In its simplest and usual form it is an arrow balanced nicely on an upright rod and free to revolve. The arrow may be attached to a spindle connected with an index or compass scale, which may be either at the bottom of the vertical spindle or at any convenient distance. In the wind vane used by the United States Weather Bureau the arrow head consists of a weighted pointer or rod secured to and balancing a tail piece composed of two thin boards about 6 inches wide and 36 inches long, fastened together near the axis but spreading apart about 5 inches at the outermost

extremity for the purpose of steadying the oscillations of the vane. The axis revolves in ball bearings and actuates an arrangement of cams and electric contact springs for automatic registration of wind direction.

The wind vane should be set up in a free and open space at a sufficient height above surrounding buildings or other obstacles to enable it to indicate the true local wind. Other forms of construction and the mechanical explanation of their action are given in Abbe's *Meteorological Apparatus and Methods* (Washington, 1887), and in United States Weather Bureau *Instructions to Observers*. See ANEMOGRAPH.

A'NER. One of the three chiefs making a covenant with Abraham in Hebron (Gen. xiv. 13, 24). Like Mamre and Eschol, this eponym hero probably owes his name to that of a locality. A hill near Hebron still bears the name Ne'r. There was also a city in Manasseh named Aner (1 Chron. vi. 70).

ANERIO, ā-nā'rē-ō, FELICE (1560-1614). An Italian composer, a pupil of Mario Nanini. In 1594 he succeeded Palestrina as composer of the Papal Chapel. Ten books of his composition were published in 1585-1622, but many unpublished manuscripts remain in the archives of the Papal Chapel. He was highly esteemed among the composers of the Italian Renaissance.

AN'EROID (containing no liquid, from Gk. ἀ, *a*, priv. + νηρός, *nēros*, liquid + εἶδος, *eidōs*, form). A barometer first made in serviceable form by M. Vidi of Paris, in 1848, in which the pressure of the air is measured by the change of form an exhausted metallic box undergoes by the influence of the atmospheric pressure.



FIG. 1. ANEROID BAROMETER.

Construction. In the diagram, Fig. 2, AA, is a circular metal box which has been highly exhausted of air and then hermetically sealed. The thin metallic faces are corrugated in concentric rings, so as to increase their flexibility and thus permit considerable motion to and fro under changes of pressure. One face of the box is fixed to the back of the brass case which contains the whole. When the box is exhausted its flexible sides collapse and touch each other, but in use this condition is prevented by the action of a stiff spring, S, which pulls the faces apart a certain distance to a position of equilibrium wherein the pressure of the air upon the

flexible sides of the box is just balanced mostly by the strong pull of the spring, but partly also by the feeble reaction of the sides of the box.

These faces being neither perfectly flexible nor yet perfectly elastic, their reaction is a disturbing influence that explains the errors of "creep" to which all aneroids are subject in a greater or lesser degree.

An increase in the pressure of the air increases the load upon the spring, *S*, and deflects it proportionately. This small motion is slightly magnified by the arm *EG*, securely fixed to the spring *S*, and transmitted through the link, *GH*, to the bent lever, *HKL*, moving in fixed pivots at *K*. From the end, *L*, of the long arm of the bent lever the motion, now further magnified, is transmitted to a little drum, *M*, by means of a very fine chain wound partly around the drum, which is mounted on the axis of the pointer,

PP, of the instrument. A small hairspring, not shown in the cut, on the axis of the pointer serves to take up all looseness in the several joints of the levers and also winds up the little chain, *O*, on the drum when a fall in pressure occurs. The best aneroids now sold are constructed upon this plan, and the box and springs are highly sensitive to changes of air pressure.

Temperature Compensation. Under a given pressure the steel spring, *S*, will deflect more when warm than cold. To compensate for this disturbing effect of temperature a piece of steel is soldered or brazed to the brass arm, *EG* (as at *T*, Fig. 2). By filing this piece of steel thinner or shorter it is possible almost completely to eliminate the disturbing effects of moderate changes in temperature, and the aneroid is then said to be "compensated," and this word is engraved upon the dial.

Graduation. The scale of the aneroid barometer generally represents inches or millimeters of air pressure as shown by the mercurial barometer, but a second scale showing elevations above sea level is often added. The altitude scale is best engraved in a fixed invariable relation to the pressure scale, but it is often placed on a ring that can be adjusted to various relations to the pressure scale. This pattern offers no real advantage and is likely to cause large errors when the instrument is in the hands of one not versed in its use.

The pressure scale is generally one of equal parts; then the parts of the altitude scale become smaller and smaller with increasing altitude. Aneroids of high grade are now often made with altitude scales of equal parts and carry a vernier to permit of very fine readings. The supposed accuracy thus obtained is illusory and imaginary.

Determination of heights. The mathematical relation between atmospheric pressure and altitude (see HYPSONOMETRY) is very complex and cannot be represented with sufficient accuracy for most purposes by a rigid scale of graduations. Suppose one reads the altitude scale of

an aneroid day after day at the same place. He will find a variation of elevation of 200 or 300 feet in a few days and even greater variations over longer intervals of time. A single reading, therefore, is a poor approximation to the elevation.

The proper way to determine an elevation barometrically is to ascertain by simultaneous readings the *difference* in air pressure at the station in question and at least one other station whose elevation is known. The *mean* temperature of the column of air between the stations and its moisture content must also be determined or estimated as accurately as possible. These data, by the use of a suitable hypsometric table, give the difference in elevation between the known and the unknown station. When simultaneous barometer readings at two stations cannot be made, the approximate sea level pressure can often be found or interpolated from daily weather maps, if such are available for the region in question. Although the aneroid is very convenient, very sensitive, and unaffected by variations in gravity, yet its instrumental error changes irregularly in a few weeks or months, sometimes in a few days, especially if exposed to rapid and large changes in pressure, as in mountain climbing, balloon ascensions, etc.

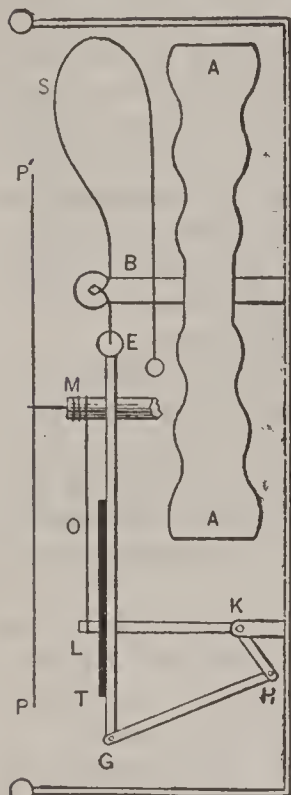


FIG. 2.

DETAIL OF ANEROID.

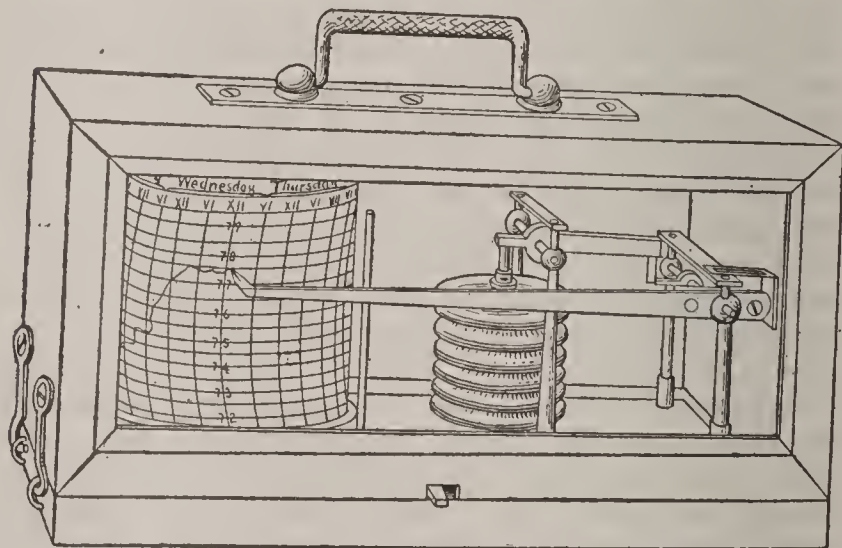


FIG. 3. BAROGRAPH, OR RECORDING ANEROID.

The Bourdon aneroid consists essentially of a portion of a thin hollow ring of elliptical cross-section, such as is used in many forms of steam and other pressure gauges. The ring is exhausted of air and then hermetically sealed, and is therefore a vacuum chamber. Changes of pressure alter the curvature of this ring, whose changes of shape are shown on a magnified scale by a delicate pointer.

The aneroid barometer is also easily arranged to be self-registering, and is then known as a barograph.

Bibliography. For fuller details of the construction and use of the aneroid, consult Abbe's *Treatise on Meteorological Instruments* (Washington, 1887), and the works referred to therein, or any of the larger treatises on experimental physics. See BAROMETER.

AN'EURIN. A Welsh poet, who probably lived c.603. According to the received account, he was the son of Caw ab Geraint, the chief of the Otadini; while others have identified him with Gildas, the historian, and Mr. Stephens, the translator of his poem, makes him Gildas's son. He was present at the battle of Cattrath as bard and taken prisoner. After his release he returned to Llancarvan and later in life lived at Galloway. He is said to have perished at

the hands of Eidyn ab Einygan. His epic poem *Gododin*, which in its present form contains over 900 lines, and is preserved in a manuscript of the thirteenth century, tells of the defeat of the Britons by the Saxons at Catteraeth; but the obscurity of the language has made it impossible to gain from it a clear account of the defeat, and it has even been maintained that the subject of the poem is the massacre of the Britons at Stonehenge (472). Stephens connects the event with the battle of Dagstan (603). The *Gododin* was published with an English version and notes in 1852, by Rev. J. Williams ab Ithel, and the text appears with a translation in F. Skene's *Four Ancient Books of Wales* (1866). The Cymmrodorian Society published in 1855 a new edition, with translation by Thomas Stephens. Aneurin is the reputed author of one other poem. Consult Maclean, *The Literature of the Celts* (Glasgow, 1906). See WELSH LANGUAGE AND LITERATURE.

AN'EURISM. A pulsating tumor, consisting of the dilated wall of an artery, or having direct communication with an artery. Arterial walls are composed of three coats, any or all of which may be involved in aneurismal formation. When the whole wall is evenly dilated, a fusiform aneurism is created. A saccular aneurism is one in which the inner and middle coats have given way at one point, making a sac or pouch, limited by the outer coat only. A dissecting aneurism occurs when the inner and part of the middle coat give way, and the blood is forced between the various layers. Cirroid aneurism occurs when several communicating arterial trunks are dilated. Sometimes a direct communication is found between an artery and a vein, in which case the latter, being exposed to unusual pressure, is apt to become distended and tortuous. Such a condition is called aneurismal varix. A false aneurism is one in which there is rupture of the entire wall of an artery and the blood comes into direct contact with the surrounding tissues. The pathological condition underlying most aneurisms is a weakening of the arterial walls from disease. Arteriosclerosis, favored by age, the excessive use of alcohol, prolonged mental strain, and syphilis are the usual factors. Immediate or exciting causes are sudden strains, injuries, violent exercise, and emotional excitement. Aneurisms prove fatal by pressure on some important part or by rupture. They are cured, sometimes spontaneously, by a deposit, within the sac, of fibrin from the blood—a result the surgeon can promote in various ways. Prolonged pressure on the trunk of the vessel was a favorite method with the older surgeons. The artery may be tied on each side of the sac close to it (method of Antyllus); on the side nearest the heart at some distance from the aneurism (method of Anel); on the distal side near the sac (method of Brasdor); or the first distal branch may be tied off (method of Wardrop). *Aneurismorrhaphy*, introduced by Matas in 1889, consists in laying open the sac and tying off all vessels leading to it without attempting to preserve the parent artery. In saccular aneurisms, however, where only one opening exists between the sac and the artery, this opening may be closed and the empty sac folded down and sutured. This is known as *endo-aneurismorrhaphy*, as is the following procedure. The blood is diverted by means of a rubber tube temporarily inserted into the walls of the vessel, on each side of the

sac. The latter is then obliterated and the wall of the artery repaired. The rubber tube is then removed and the blood allowed to flow through the natural channel. Endo-aneurismorrhaphy is now practiced in many cases where extirpation would formerly have been done, and constitutes a great advance in this branch of surgery, since it preserves the blood supply of the part and prevents many complications which are incident to a sudden cutting off of the circulation. Aneurisms inaccessible to surgical attack are sometimes treated by inserting needles into the tumor; or by inserting and coiling fine silver or gold wire within the sac, to promote clotting. Sometimes an electric current is passed through the coiled wire. Internal aneurism requires prolonged rest and the administration of remedies that quiet the heart's action.

ANFOSSI, àn-fòs'sê, PASQUALE (1729-97). An Italian composer. He was born at Naples, was a pupil of Sacchini and Piccini, and wrote *Il finto medico* (presented in 1764) as his first operatic composition. He was appointed chapelmaster at Venice in 1775 and directed the opera at London from 1781 to 1783. Subsequently he was choirmaster in the church of St. John Lateran, Rome. Of his numerous operas, which are marked rather by skillful arrangement than by much originality, the best known were *L'avarò*, *Il curioso indiscreto*, and *I viaggiatori felici*. His sacred compositions are considered less important.

ANGARA, àn-gä'rá. A river in Siberia, the most important affluent of the Yenisei on its right (Map: Asia, J 3). Properly speaking, there are two rivers by that name: the Upper Angara, rising among the ridges of the Olekma and Vitim Mountains, lat. 57° N. and long. 114° 56' E., and emptying into the northern end of Lake Baikal; and the Lower Angara, an outlet of the lake, whence it issues as a stream of clear, transparent water, flowing by the city of Irkutsk toward the north, then to the west, for a distance of about 1300 miles. The river is about 9000 feet wide at its broadest part and 1600 feet at its narrowest. It is of sufficient depth for navigation as far as Irkutsk, but has numerous rapids in the middle of its course. Steamers do not ascend farther than its junction with the Ilim. Obstructions in the channel have been removed and the most dangerous rapids have been circumvented so that navigation has been greatly improved. Into the Angara fall numerous considerable tributaries—the largest of which are Irkut, Kitai, Bielaya, Oka, and Tasserva on the left, and Kunda, Yanda, Ilim, and Tchadobetz on the right. It was discovered by the Cossack traders early in the seventeenth century; in 1645 Kolenikoff ascended it as far as the lake of Baikal. The Lower Angara is also called Upper Tunguska.

AN'GEL. An antiquated English gold coin, varying in value from \$1.60 to \$2.50. It was so called from the figure upon its obverse of the Archangel Michael piercing the dragon. Angels were coined from Edward IV to Charles I.

ANGEL (Gk. ἄγγελος, *angelos*, messenger). The English word denotes a superhuman being intermediate between God and man. But the original meaning was simply that of a "messenger," either human or superhuman. It is doubtful whether the word was used at all in pre-exilic times as a designation of a being greater than man. In Gen. vi. 2, the term "sons of God" was rendered "angels" by the Greek ver-

sion; in earlier days they were no doubt regarded as divine beings. The "angel of Yahwe" is thought by many scholars to be a manifestation of this deity, and it was probably so understood in antiquity; but the "angel" is likely to have been brought into the text as a substitute for Yahwe himself, appearing in the original form of the narrative. In Jacob's vision the "angels" seem also to have been originally "gods" or "sons of gods." As long as Yahwe manifested himself in human shape, he had no need of a messenger. There were beside him "gods many and lords many" with their habitat in the sky or on the earth, in trees and fountains and stones, by the hearth and in the tomb; but they were not messengers. The gods formed a heavenly council. In the story of the Garden of Eden the divine being who speaks declares: "Man has become like one of us." Possibly the title "Yahwe of hosts" refers to armies of such spirits. But they were simply called *Elohim*, or *Bene Elohim*, "sons of gods," not "angels."

It was the growth of monotheism that forced reflection upon the character of these superhuman beings. The second Isaiah looked upon the gods of the nations as mere lifeless statues. This view could not gain permanent ascendancy. It was too superficial. Only the subordination of all spirits to Yahwe was essential. The gods of the peoples ceased to be independent rulers and became Yahwe's servants, henceforth to do his bidding in connection with the natural forces and elements with which they had been previously associated, or as guardians of the nations they had once governed.

In Daniel the celestial princes of Persia and Greece are mentioned, and already in Deut. xxxii. 8, 9, the original text is supposed to have expressed the idea that when the gods divided between themselves the nations Israel fell on Yahwe's lot. The sons of the gods have become angels in the prologue to Job. An increasing emphasis on the divine transcendence caused a reluctance to ascribe to him certain activities. He no longer reveals himself directly, but through an angel, to his prophets; he does not fight his people's battles, but his chief angel stands up for Israel; he no longer tempts to evil or inflicts it himself, but allows an angel, the Satan, to do this. Angels receive individual names, Michael, Gabriel, Raphael, Uriel. Under the influence of Persian thought, the conception of seven archangels is introduced, corresponding to the seven *amesha spentas*, and these angels are spoken of as "watchers." The idea that the angels were created is found in the Book of Enoch and the Book of Jubilees. The fall of the angels is not taught expressly in the Hebrew Bible, though there are hints of conflicts in heaven, and God is said to find wickedness in his angels; the idea is fully developed in the Book of Enoch.

Jesus in his discourses mentions angels, and, indeed, represents each human being as having a celestial patron (Matt. xviii. 10), pictures the angels as rejoicing over the repentance of sinners (Luke xv. 10), and states that those who are permitted to share in the resurrection will be like angels, having no conjugal relations (Matt. xxii. 30). The evangelists expected his return upon the clouds of heaven as the Messiah accompanied by his holy angels. In the Apocalypse angels figure prominently. They also occur frequently in Paul's writings. Angels are said to be created (Col. i. 16), and should not be

worshiped (Col. ii. 18). Instead of the earlier conception that God himself had written the decalogue and given the law to Israel, the angels were conceived of as the agencies through which the law was given (Gal. iii. 19). The prevalent interpretation of Gen. vi. 1, as referring to intercourse between angels and women, is supposed by many scholars to be the cause of the commandment to women not to wear veils (1 Cor. xi. 10). The angels are powerful beings, "thrones" and "principalities," and men should not turn away from Christ to these "elementary spirits of the world" (Gal. iv. 3).

In the Christian Church the belief in angels has continued until the present time, though gradually losing its intensity through the accession of martyrs and saints to the class of intermediaries between God and man, and in more recent times through the spread of rationalistic tendencies of thought. An excellent summary of our present knowledge of Jewish angelology is found in Dr. K. Kohler's article on this subject in *The Jewish Encyclopædia*; the relations to Babylonian thought are well treated in R. Stübe's *Jüdisch-Babylonische Zaubertexte* (Halle, 1895), and the relations to Mazdaism in Nathan Söderblom's *La vie future dans le Mazdeisme* (Paris, 1901). The names of angels in the Book of Enoch have been discussed by N. Schmidt in *Old Testament and Semitic Studies, in Memory of W. R. Harper* (1908), and Barton in *Journal of Biblical Literature* (1912). A large number found in Jewish and Mandæan lore have been discussed by Montgomery, *Aramaic Incantation Texts from Nippur* (1913).

The creation of the angels was placed, by the Platonizing Church Fathers, before that of the material world; others assigned to it some one of the six days. Equally various were the opinions as to the nature of the angels. The second Council of Nicæa (787) assigned them a subtle, ethereal, or fire-like body; the scholastics, on the other hand, and the Fourth Lateran Council (1215) maintained their immateriality; while others, owing to the appearing of angels, mentioned in Scripture, attributed to them the power of assuming momentarily the corporeal form.

Some of the patristic writers also spoke of good and bad guardian angels, the former of whom were always ready to prompt to good actions and to avert evil, while the latter were equally quick in bringing about mischief, wickedness, and calamity. From the belief in the guardianship of angels, and their participation in the government of the world, arose naturally the practice of invoking and worshiping them. Ambrose said: "We should pray to the angels who are given to us as guardians" (*De Viduis*, ix). Many Christian teachers condemned it, appealing to Col. ii. 18; and the Council of Laodicea, in the fourth century, called it disguised idolatry. But after the Second Council of Nicæa had conceded that, though angels were not to receive divine worship, they might receive reverential obeisance, the practice mentioned became more and more rooted, and continues in the Greek and Roman Catholic churches to this day.

ANGEL, BENJAMIN FRANKLIN (1815-94). An American diplomat, born at Burlington, N. Y. He studied law and was admitted to the bar and served as surrogate in 1834-41 and 1844-47. He was sent as United States Consul to Honolulu in 1853. The same year he was special commissioner to China for the settlement of differences

between the Chinese government and American merchants with regard to the levying of export duties. He was Minister to Sweden and Norway in 1857-62; a delegate to the Chicago Democratic convention in 1864; and in 1873-74 president of the New York State Agricultural Society.

AN'GELA MERICI, mâ-rê'chè, SAINT (1470-1540). Founder of the Roman Catholic order of Ursulines (q.v.). She was born at Desenzano, on Lake Garda, was of the Franciscan tertiaries when she founded in Brescia the order in 1535, and died there, Jan. 27, 1540. Consult her life by Sintzel (Regensburg, 1842) and by J. A. At (Notre Dame d'Alet, 1885).

AN'GEL FISH (alluding to its large, wing-like fins), or ANGEL SHARK, or MONK FISH. An elasmobranch (*Squatina angelus* or *squatina*), very closely related to the shark, with a broad and flattened body and with the much enlarged pectoral fins expanded laterally like wings. It attains a size of three to four feet, and is harmless, being sluggish and feeding on crabs and shells, which it crushes with its small, nail-like teeth. It is found in tropical seas, is common in the Mediterranean, and also occurs upon both the eastern and western shores of the warmer parts of North America, keeping near the bottom and being nowhere numerous. It is also known to American fishermen as "monk fish."

Another angel fish in the United States is one of the porgies (*Chatodipterus faber*). See PORGY.

In Bermuda the name is applied to chatodonts of the genus *Holacanthus*, and especially to the widely distributed emperor fish (*Holacanthus ciliaris*). Goode says that it attains a weight of four pounds and "far surpasses all the other fishes of the region in the delicious flavor and in its lovely hues." A second species is the black angel fish (*Holacanthus tricolor*), which, like the other, is common throughout West Indian waters. See CORAL FISH, and Plate of CORAL FISHES.

ANGELI, än'gë-lî, HEINRICH VON (1840—). A historical, genre, and portrait painter. He was born at Odenburg, Hungary, studied in the Vienna Academy and with Leutze at Düsseldorf, where he painted the famous picture, "Mary Stuart at the Reading of the Death Warrant" (1857). In 1859 he went to Munich and in 1862 he removed to Vienna, where he soon won recognition as a painter of portraits, particularly those of royalty. Some of the best of his portraits are those of the Crown Prince Frederick William (1874); General von Manteuffel (1879) and Andreas Achenbach (National Gallery, Berlin); Field-Marshal von Moltke (Museum of Breslau, 1884); "Queen Victoria Enthroned" (1885); "Emperor William II in the Uniform of a General" (1888), and Empress Maria Fedorovna of Russia. His portraits are characterized by a certain elegance of bearing and by picturesque arrangement.

ANGEL'ICA (Lat., angelic, i.e., plant or herb, in allusion to its medicinal qualities). A genus of plants of about 40 species belonging to the family Umbelliferæ. The species are tall perennial herbs, natives of the northern hemisphere and New Zealand. Wild angelica (*Angelica sylvestris*) is a common plant in moist meadows, by the sides of brooks, and in woods throughout many parts of Europe and Asia. The root is perennial, short, ringed, and branched; it is white within, and contains a yellow, milky juice.

Garden angelica (*Archangelica officinalis*) is a biennial plant, becoming perennial when not allowed to ripen its seeds. It has greenish flowers in almost spherical umbels. The stem is as high as a man. The fruit is long and straw-colored. The root is long and fusiform, an inch or more in thickness, with thick, irregular rugose rootlets. The whole plant, and especially the root, is aromatic and bitter, containing much resin and essential oil. The root has been admitted into the pharmacopœias as an aromatic stimulant and tonic, and occasionally used in nervous ailments, indigestion, flatulence. The root of *Angelica sylvestris* is sometimes substituted for it, but is much weaker. The garden angelica was at one time much cultivated for the blanched stalks, which were used as celery now is; but its cultivation for this purpose has been almost entirely discontinued. The tender stalks and midribs of the leaves, candied, are still, however, a well-known article of confectionery and an agreeable stomachic; the roots and seeds are employed in the preparation of gin and of "bitters." The plant is a very doubtful native of Great Britain, but is common in many parts of Europe and even in Lapland and Iceland. The Laplanders not only use it as food, but regard the stalks roasted in hot ashes as an efficacious remedy in pectoral disorders. The powdered seeds of the wild angelica are used by the country people in some parts of Europe to kill lice. About 20 species of *Angelica* are natives of North America, *Angelica villosa* and *Angelica atropurpurea* being the best known in the eastern United States. They are perhaps without any important economic value.

ANGEL'ICA. 1. In Boiardo's *Orlando Innamorato* and Ariosto's *Orlando Furioso*, a beautiful and faithless Oriental princess, the mischief-maker who beguiles Orlando. She is noted for her magic ring, which had the power of making its wearer invisible. 2. In Congreve's *Love for Love*, an attractive heiress. 3. A character in Farquhar's *The Constant Couple* and *Sir Harry Wildair*.

ANGELICA TREE. See ARALIA.

ANGEL'IC DOCTOR, THE (Lat. *Doctor Angelicus*). Thomas Aquinas, so called by his admirers; known also as "The Angel of the Schools."

ANGELIC HYMN. Another name for the *Gloria in Excelsis* (q.v.).

ANGELICO, FRA (1387-1455). A Florentine religious painter, the last and greatest of the transition from the Middle Age to the Renaissance in Italy. His original name was Guido da Vecchio, and he assumed the name of Giovanni (John) on entering the convent of Fiesole, whence he is often called Fra Giovanni da Fiesole, or, incorrectly, Fiesole. Angelico refers to the character of the good friar, who was afterward beatified. He was born in 1387 at Vecchio, in the fertile Mugello district, a Florentine possession in Tuscany, and entered the reformed Dominican convent at Fiesole in 1407. The head of this house, the pious and able St. Antoninus, probably had a great influence in forming the young brother's character. As the Order adhered to Gregory XII in the papal schism, the brethren were exiled to Foligno and Cortona in 1409 and did not return to Fiesole until 1418. Angelico's master in painting is unknown, but from the character of his work it is evident he began as a miniaturist. His

style shows Sienese affinities, and he may have been influenced by Lorenzo Monaco. Paintings of his earliest period survive at Cortona: "Madonna and Four Saints" with predella of "Life of St. Dominick," in San Domenico, and a beautiful "Annunciation" with predella of "Life of the Virgin," in the Oratorio dell Gesù. Soon after the return to Fiesole he must have painted four small reliquary panels, the most celebrated of which, the "Madonna of the Star" (see illustration), was recently stolen from San Marco, but speedily recovered (1912). Of a not much later date is the remarkable predella, now in the National Gallery, London, "Christ in Glory Surrounded by Saints and Angels"—266 figures in all. To the Fiesolan period belong also the "Coronation of the Virgin" in the Florence Academy, and the larger and finer example of the same subject in the Louvre; also the impressive "Last Judgment" with its delightful representation of Paradise, in the Florentine Academy. Another version of the same subject, perhaps of a later date, is in the Berlin Gallery. In 1431 Angelico signed the contract for the "Madonna of the Linen Weavers," Uffizi, the chief glory of which is the 12 surrounding angels making music—the best known of all his figures. The works of his early period are Gothic in character and decoration, but from about 1430 Renaissance elements appear.

In 1436 the Dominicans of Fiesole moved to the convent of San Marco in Florence, which the munificence of Cosimo de' Medici converted into a house of their order. Michelozzo was the architect, and his architectural forms greatly impressed Angelico and often appear in his work. He was also influenced by the frescoes of Masaccio, in the Brancacci Chapel, as may be seen by his improved rendition of the nude and of movement. For the high altar of the convent church he painted his well-known "Madonna di San Marco," now in the Florentine Academy, and from about the same time dates the "Deposition" said to contain the portrait of Michelozzo. His many beautiful frescoes at San Marco were the cause of its conversion into a national museum. The cloisters contain, among others, "St. Dominick at the Foot of the Cross" and "Christ as a Pilgrim"; the chapter house, a much larger fresco of the "Crucifixion," and in the cells above are 43 frescoes, painted from about 1438 to 1455. Among the most beautiful of these are the "Noli mi Tangere," "Adoration of the Kings," the "Transfiguration," and the "Virgin Enthroned."

In 1455 Fra Angelico was summoned to Rome by Pope Eugenius IV to fresco the Chapel of the Sacrament in the Vatican, which has unfortunately been destroyed. In the summer of 1447, assisted by his pupil Benozzo Gozzoli, he decorated part of the ceiling of the Chapel of San Brizio in the cathedral of Orvieto with the subjects, "Christ in Judgment," surrounded by angels, and "The Prophets." The following winter he probably began the frescoes of the Chapel of Pope Nicholas V, in the Vatican, with eight scenes from the lives of Sts. Stephen and Lawrence. These are his greatest works and show his art at its zenith; for in them he has achieved the perfect freedom of the Renaissance. In 1449 he was prior of his old convent at Fiesole, where we still find him in 1452. He died in the house of his Order at Rome, and his famous grave slab still rests in their church, Santa Maria sopra Minerva.

The traditional view of Fra Angelico as a man of infinite goodness, sincere piety, and sacramental earnestness in his work has proved the correct one. He was par excellence the religious painter of the Renaissance, and his work was really seraphic. His effects are attained by the wonderful expression of the faces and the beauty of color and arrangement. Although his early paintings are deficient in technique, his progress was constant. He gradually mastered the nude, movement, and perspective, and in his last works, the Roman frescoes, he ranks as one of the foremost painters of the Renaissance. In some respects he was even an innovator, being one of the first to paint the Christ Child as a real infant, and the very first to paint a landscape that can be identified, and to communicate a sense of the pleasantness of nature.

Bibliography. The best biographies of Fra Angelico are the delightful and interesting booklet by Supino (Florence, 1898; Eng. trans., Florence, 1902), and the scholarly effort of Langton Douglas (London, 1901). Other treatises are by Cartier (Paris, 1857; new ed., 1902), Förster (Regensburg, 1859), Goodwin (London, 1861), Phillimore (London, 1881), Ley (London, 1886), Beissel (Freiburg, 1895; 2d. ed., 1905), Tumiatì (Florence, 1897), Crawford (London, 1900), Williamson (London, 1901), Niewbarn (Leyden, 1901), Broussole (Paris, 1902), Rothes (Strassburg, 1902), Sortais (Lille, 1905), Cochin (Paris, 1906), Newnes (London, 1906).

ANGELIC SALUTATION. See AVE MARIA.

AN'GELI'NA. 1. In *The Rival Ladies*, by Dryden, a sister of Don Rhodorigo. 2. In Goldsmith's ballad of "Edwin and Angelina" in *The Vicar of Wakefield*, the heroine. 3. A pseudonym used by Harriet Martineau.

ANGELIQUE, àn'zhâ'lêk'. 1. In Molière's *Le malade imaginaire*, the daughter of the "invalid" Argan. 2. In Molière's *Georges Dandin*, the aristocratic wife of the rich peasant who is the principal character.

ANGELL, ân'jêl, GEORGE THORNDIKE (1823–1909). An American philanthropist. He was born at Southbridge, Mass., and was educated at Brown University, Dartmouth College, and Harvard Law School. After his admission to the bar, in 1851, he practiced in Boston for many years. In 1868, with several other influential persons, he founded the Massachusetts Society for the Prevention of Cruelty to Animals, of which association he was later elected president. In the same year he established the publication entitled *Our Dumb Animals*, the first periodical of its kind. During a visit to England in 1869 he urged the Royal Society to publish the *Animal World* and induced the Baroness Burdett-Coutts to organize the Ladies' Humane Educational Committee of England; and he was instrumental in the formation of many similar societies throughout the United States. In 1882 a movement for the establishment of "Bands of Mercy," with the promotion of kindness to animals as their object, was initiated by him. After 26 years 72,000 of these societies were in active existence. In 1889 he was empowered by the Massachusetts Legislature to incorporate the American Humane Education Society. Mr. Angell has also been instrumental in establishing several public health associations and in promoting the movement directed against the sale of poisonous and adulterated foods. Many



FRA ANGELICO

MADONNA OF THE STAR, IN THE CONVENT OF SAN MARCO, FLORENCE

of his publications have been translated into foreign languages. One of them is the entertaining volume entitled *Autobiographical Sketches and Personal Recollections* (Boston, 1891).

ANGELL, JAMES BURRILL, LL.D. (1829–1916). An American educator and diplomat. He was born in Scituate, R. I., graduated at Brown University in 1849, and after travel in the South and in Europe became, in 1853, professor of modern languages and literature in Brown University. He was the editor of the *Providence Daily Journal* from 1860 to 1866, when he was appointed to the presidency of the University of Vermont. In 1871 he became president of the University of Michigan, which under his continued administration came to be one of the foremost universities in the country. He was United States Minister to China from 1880 to 1881, at the same time acting as one of three commissioners to negotiate a new treaty with that government. Dr. Angell was a member of the Anglo-American International Commission on Canadian Fisheries in 1887, and in 1896 he was chairman of the Canadian-American commission on a deep waterway from the great lakes to the sea. He was appointed Minister to Turkey in 1897, but resigned in May, 1898. In 1887 he became a regent of the Smithsonian Institution. In 1909 he was made president emeritus of the University of Michigan. Besides numerous addresses and frequent contributions to magazines, President Angell published *Progress in International Law* (1875), the article on "The Diplomacy of the United States," for the *Narrative and Critical History of America* (1888); *Reminiscences* (1912); *Selected Addresses* (1912).

ANGELL, JAMES ROWLAND (1869—). An American psychologist. He was born in Burlington, Vt., the son of James Burrill Angell (q.v.), and graduated from the University of Michigan in 1890. Post-graduate studies he took at Michigan, Harvard, Berlin, and Halle universities, and in Paris, Vienna, and Leipzig. In 1893 he was instructor in philosophy at the University of Minnesota, a position which he left in the following year to begin a long service in the University of Chicago—becoming assistant professor of psychology and director of the psychological laboratory (1894), associate professor of psychology (1901), and professor and head of the department (1905). In 1908 he was appointed senior dean of the University of Chicago, and in 1911 dean of the University faculties. He became a member of several learned societies, and in 1906 had tendered to him the presidency of the American Psychological Association. His writings include *Psychology* (3d ed., 1907); *Chapters from Modern Psychology* (1911).

ANGELL, JOSEPH KINNICUT (1794–1857). An American lawyer. He was born in Providence, R. I., and graduated at Brown University in 1813. He published a *Treatise on the Law Concerning the Liability and Rights of Common Carriers* (2d ed., 1845); a *Treatise on the Common Law in Relation to Water Courses*, with an appendix (5th ed., 1850); *A Practical Summary of the Law of Assignments* (1835); a *Treatise on the Law of Fire and Life Insurance* (1854); with Chief Justice Samuel Ames, a *Treatise on the Law of Private Corporations* (4th ed., 1858), etc. He also edited the *United States Law Intelligencer and Review* (1829–31).

Consult S. S. Rider, "Bibliographical Memoirs of Three Rhode Island Authors," in *Rhode Island Historical Tracts*, 11 (Providence, 1880).

ANGELL, NORMAN. See LANE, RALPH NORMAN ANGELL.

AN'GELO. 1. In Shakespeare's *Measure for Measure*, the duke's hypocritical deputy. The Duke frustrates his evil designs, compelling him to give up Isabella and marry Mariana, whom he has deserted. 2. A character in Shakespeare's *Comedy of Errors*.

ANGELO, MICHAEL. See MICHELANGELO.

ANGELO, TYRAN DE PADOUE. A drama in prose by Victor Hugo, produced by the Comédie Française, April 28, 1835. It was produced later in London (translated by G. H. Davidson) as *Angelo and the Actress of Padua*. The period of the action is the sixteenth century.

ANGEL OF THE CHURCH. The term applied in Revelation to each of the recipients of the Saviour's messages to the Seven Churches of Asia. It is perhaps best to understand it as meaning the presiding officer of the Church, who would naturally be the one to whom a message would be sent, and who may fairly be considered representative of the churches (cf. Rev. i. 20). See CHURCHES OF ASIA, THE SEVEN.

AN'GELUS, THE. A well-known painting by J. F. Millet (1859). It represents two French peasants stopped in their field work for a moment of prayer at dusk by the Angelus bell, which the artist has suggested by the church spire in the distance. It was sold by the artist for a small sum, but in 1889 was bought by the American Art Association for more than 580,000 francs and exhibited in this country. The next year M. Chauehard bought it for \$150,000; it is understood that it will ultimately find a place in the Louvre.

ANGELUS BELL, THE. A bell rung in all Catholic countries morning, noon, and night to invite the faithful to the recitation of the angelic salutation. Formerly the hours for the ringing of the Angelus were at sunrise, noon, and sunset, but it is now more generally heard at the appointed hours of noon and six o'clock both morning and evening. The bell receives its name from the title given the prayer recited at this time, *Angelus Domini*, also called *Ave Maria*.

ANGELUS DOM'INI (Lat., The Angel of the Lord). The name of a brief prayer repeated by Roman Catholics at the sound of the Angelus bell, at sunrise, noon, and sunset.

ANGELUS SILESIUS, sî-lē'shī-ūs, JOHANN SCHEFFLER (1624–77). A German religious poet. He was born in Breslau, studied medicine at Strassburg, Leyden, and Padua, and in 1653 entered the Catholic Church. In 1661 he joined the Minorites and was ordained priest. His earlier writings include a number of pronouncedly mystical poems, such as the *Cherubinischer Wandersmann* (1657), a profound and pantheistic description of the way to God. Subsequently he became a fanatical controversialist. He wrote some stirring hymns, of which some found their way even into Protestant hymnals. There is an edition of his works, by Rosenthal (2 vols., 1862). Consult also: Schrader, *Angelus Silesius und seine Mystik* (1853); A. Kahlert, *Angelus Silesius: Eine litterarhistorische Untersuchung* (1853); the biography by C. Seltmann (Breslau, 1876); Wilhelm Bölsche, "Ueber den Wert der Mystik unserer Zeit," in the new edition of *Cherubinischer Wandersmann* (Jena, 1905).

ANGELY, ä'n'zh'lé', LOUIS (c.1788–1835).

A German actor and dramatist. He was born in Berlin and began his career as an actor early in life. He was at first a comedian at the German theatre at St. Petersburg and in 1828 went to Berlin, where for two years he was a rather mediocre actor and afterward skillfully adapted French plays to German conditions. Among his best productions are: *Paris in Pommern*, *Die Hasen in der Hasenheide*, *Wohnungen zu vermieten*, *Sieben Mädchen in Uniform* (very successful), *Von Sieben die Hässlichste*, and *Das Fest der Handwerker*, which is still played. His plays were collected and published under the titles of *Vaudevilles und Lustspiele* (4 vols., Berlin, 1828-42), and *Neuestes komisches Theater* (3 vols., Hamburg, 1836-41).

AN'GER (Icel. *angr*, grief, straits; OHG. *angust*; Ger. *Angst*, anxiety; Lat. *angor*, a choking, strangling, anguish, from the root *ang*, seen in Lat. *angustus*, narrow, close; Gk. *ἄγχι*, *anchi*, near; Ger. *eng*, narrow, close; AS. *ange*, *onge*, narrow, strait, troubled). An emotion (q.v.) characterized by a peculiar, aggressive attitude toward its object (usually a person) and by the large number of expressive bodily movements which accompany it. Wundt has attempted a detailed analysis of the emotion. Anger, he finds, belongs to the group of emotions that always refer to some external object. Its various forms differ from one another in three ways. 1. They differ qualitatively, i.e., in the relative amounts of their component feelings. For example, irritation contains a fusion of unpleasantness and excitement, while rage contains unpleasantness and depression. Furthermore, there is a greater amount of unpleasantness in irritation than in rage, so that the former emotion is more subjective—there is a greater consciousness of self. Since, therefore, all forms of anger are objective, and since some forms are further characterized by the dominance of subjective feelings, we may distinguish two classes of anger, the subjective-objective, in which the subjective feelings are most prominent, and the objective-subjective class in which the feelings which refer to the object are so strong that we are scarcely aware of self. 2. They also differ in intensity. Some forms, as rage, are strong; some, as chagrin, are weak; other forms are variable. These two differences, viz., quality and intensity, determine the general character of the emotion. The subjective-objective forms arranged in the order of increasing intensity are: chagrin, irritation, exasperation. The objective-subjective forms arranged in the same order of intensity are: offense, anger, rage. 3. Finally, the various kinds of anger may differ in their modes of occurrence. This difference is determined by the rapidity of the succession of the component feelings. For example, rage may be sudden, it may arise gradually, or it may be intermittent.

The most common bodily accompaniments of anger are vaso-motor disturbances (most easily seen in flushing and pallor), glandular secretion (such as tears and saliva), modifications of respiration, and involuntary movements. Other more or less specific bodily signs are screaming, crying, threatening articulations, trembling, stamping, facial contortions, scratching, striking. The coarser bodily expressions of anger are more moderate in the adult and the cultured than in the child and the primitive man. The efforts of society to secure justice and well-being for the individual destroy many of the sanctions

for anger and also control its manifestations. Doubtless the value of anger in the history of the race has been great. It has prevented the encroachments upon the individual which tend toward extermination. Consult W. Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1911).

ANG'ERBO'DA. In Norse mythology, a giantess, mother of Fenrir.

ANGERMANELF, *ōng'ēr-mān-ēlf'*. A river in Sweden, rising on its western boundary (Map: Sweden, G 5). After passing numerous lakes, it enters the Gulf of Bothnia by a large estuary, north of Hernösand. It is about 150 miles long, navigable for small craft for 75 miles, and celebrated for the beautiful scenery of its banks.

ANGERMANLAND, *-lānt'*. A former division of Sweden, now chiefly comprised in the län of Vesternorrland. It extends along the Gulf of Bothnia and is watered by the Angermann River. The district exhibits great variety of wild and beautiful landscape—wood, mount, stream, and lake. It is under a high state of cultivation, produces barley, rye, and peas, and abounds in excellent pasture-land. The inhabitants are known for their sobriety, industrious habits, and general prosperity. The chief town and port, Hernösand, had a population of 9350 in 1910. It stands on the small island of Hernö, near the mouth of the Angermann River, and has weekly steam communication with Stockholm.

ANGERMÜNDE, *äng'ēr-mūn'de*. A garrison town and railway junction on Lake Münde, capital of a circle of the same name in the province of Brandenburg, Prussia, 45 miles northeast of Berlin by rail (Map: Prussia, E 2). It has iron foundries and manufactures woolen and linen goods. Its principal public building is St. Mary's Church, a lofty Gothic structure of the fourteenth century. Pop., 1895, 7334; 1905, 7589; 1910, 8200.

AN'GERO'NA. An early Roman divinity in some way connected with silence and always represented with her finger on her lips or with the mouth bound with a fillet or gagged. Her festival, the Angeronalia, or Divalia, which was celebrated on the 21st of December, would seem to indicate some relationship with the winter solstice. Later she took on the nature of a goddess of sorrow and disease. See Fowler, *Roman Festivals* (New York, 1899).

ANGERONALIA. See ANGERONA.

ANGERS, *än'zhâ'* (the ancient *Andes*, capital of a Gallic tribe, known under the Lat. form *Andecavi*). Formerly the capital of the duchy of Anjou, and now of the French department of Maine-et-Loire, situated on both sides of the navigable river Mayenne, not far from the junction of the Sarthe with it, about 5 miles from its confluence with the Loire and 190 miles southwest of Paris (Map: France, N., E 5). Old Angers, 'the Black City,' is fast disappearing, and a new, bright town taking its place. The cathedral of St. Maurice is one of the oldest surviving structures and is a fine specimen of thirteenth-century Gothic. The castle of Philip Augustus still stands, with its round towers. Angers is the see of a bishop. It has several colleges, a university with faculties of law, mathematics, science, and philosophy, a school of art, a theological seminary, an institution for the deaf and dumb, a botanical garden, a large picture gallery, several museums and theatres, a public library, and several old churches. The ruins of the ancient castle of

Angers, built by St. Louis about the middle of the thirteenth century, are situated on a projecting rock above the river. Sail-making, cotton-spinning, stocking-weaving, the manufacture of umbrellas and parasols, etc., are carried on to a considerable extent, and there is a trade in corn, wine, brandy, flax, hemp, honey, etc. There are important slate quarries in the neighborhood. Angers is the birthplace of René of Anjou, the learned Ménage, the publicist, J. Bodin, and the sculptor David, whose statue was unveiled in the Place de Lorraine, Oct. 24, 1880. Pop., 1901, 82,398; 1911, 83,786. Consult A. Debidour, *La Fronde angevine; la vie municipale au XVII^e siècle* (Paris, 1877).

ANGERS, AUGUSTE REAL (1838—). A Canadian lawyer and statesman. He was born in Quebec, educated at Nicolle College, and admitted to the bar in 1860. He soon attained considerable success in legal practice and in 1874 was elected as a Conservative to the Legislative Assembly, taking office in the De Boucherville ministry successively as Solicitor-General and Attorney-General. In 1879 he was elected to the Dominion House of Commons, but in 1880 was appointed a judge of the Superior Court of Quebec, an office which he held for seven years. During 1887-92 he was Lieutenant-Governor of Quebec province, and in 1891 caused much political excitement and criticism by his dismissal of Honoré Mercier, Premier of the province. In December, 1892, he was appointed to the Dominion Senate, when he became a member of the Conservative ministry of Sir John Thompson. He was also a member, successively, of the brief ministries of Sir Mackenzie Bowell and Sir Charles Tupper. Upon the defeat of the Tupper ministry in 1896 he retired to private life.

AN'GEVIN LINE, or **DY'NASTY**. The English kings from Henry II to John, since their family, the Plantagenets, came from Anjou in France.

ANGHIERA, än-gyâ'râ, or **ANGHERA**, äng-ä'râ, PIETRO MARTIRE DE. See PETER MARTYR.

AN'GILBERT, *Fr. pron.* än'zhêl'bâr', SAINT (c.740-814). A friend and privy councilor of Charlemagne, the most distinguished poet of his age, who in 790 became Abbot of Centula (the present St. Riquier). In 800 he was present in Rome at the coronation of the Emperor. He was a member of the so-called Academy at the court of Charles, in which he bore the honorary name of Homer. By Bertha, the daughter of Charlemagne, he was father of two sons, Harnid, and Nithard, the historian. His poems, edited by E. Dümmler, are to be found in the *Monumenta Germaniæ Historica*.

ANGI'NA PEC'TORIS (Lat. tightening of the chest or heart), or **STENOCARDIA**. It is characterized by intense pain, a sense of constriction, and a feeling of impending dissolution, which occur in paroxysms beginning over the region of the heart, or deep in the chest, and extending toward the left shoulder. The attacks are apt to appear in succession, and ultimately they kill the patient. Attacks occurring in persons showing evidence of arterio-sclerosis are called *true angina*; those occurring in individuals lacking such evidences are termed *false angina*. As to the true pathological basis of angina pectoris we are still uncertain. It is a symptom, not a disease, and is an incident in the progress of circulatory disorders. Changes in the heart, aorta, and arteries, varying from extensive valv-

ular disease to a mild arterio-sclerosis, have been described. These changes are, however, not constant, and are also found in cases which die with no symptoms of angina. There is usually disease of the coronary or heart arteries, of the nature of an arterio-sclerosis or thickening of the walls. This may be especially marked at the origin of the vessels, and diminishes their lumen. Various theories have been advanced as to the true nature of angina. It has been considered as a neuralgia of the cardiac nerves, as a spasm of the heart muscle, as due to extreme dilatation of the heart, and as a temporary anæmia of the heart muscle due to disease or spasm of the vessels supplying it with blood. Angina pectoris is an affection of adult life, occurring most frequently between the ages of 40 and 50. The paroxysms may be induced by any excess in diet, by exertion, as walking uphill or against a strong wind, or by mental emotions. It is therefore advisable for those who have had an attack of angina to lead a quiet, regular life, avoid excesses of all kinds, and particularly refrain from mental excitement. During an attack the physician usually administers morphine, nitrite of amyl, nitro-glycerin, or chloroform.

ANGIOLIERI, än'jô-lyä'rê, CECCO (c.1250-c.1312). An Italian humorous poet of Dante's time, born at Siena. He sang of his quarrels with his father, his misadventures in love, and the poverty under which he suffered. His verse is original in form. No fewer than three sonnets are devoted to Dante, who, it is inferred, charged him with being a parasite, for in the last of these sonnets Cecco hurls the epithet back at him with a vigor which must have severed their relations once for all. Cecco himself figures in one of the tales of the *Decameron* (ix, 4). Consult Gaspari, *Italian Literature*, Oelsner's translation (London, 1901): D'Ancona, *Studj di Critica e Storia letteraria* (Bologna, 1880).

ANGIOLI'NA. The young wife of the Doge of Venice, Marino Faliero, in Byron's work of that name.

AN'GIO'MA. See TUMOR.

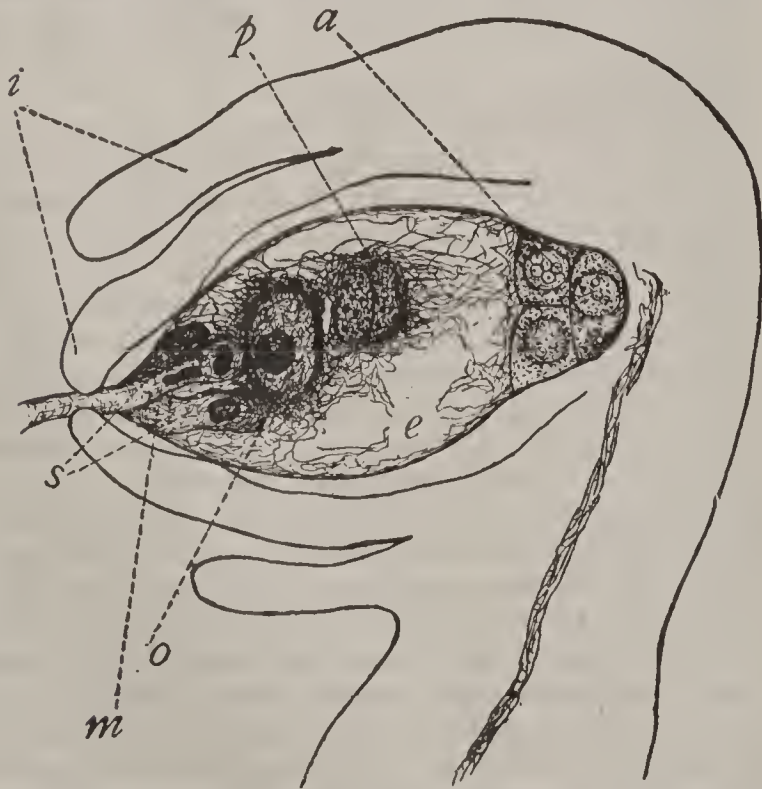
ANGIOSPERMS, än'ji-ô-spêrmz (Gk. ἀγγείον, *angeion*, vessel + σπέρμα, *sperma*, seed). A name applied to the greatest group of seed-plants, Spermatophytes, as distinguished from the other group, Gymnosperms, in which the "seeds are naked." The Angiosperms are estimated to comprise approximately 140,000 species, and they form the most conspicuous part of the vegetation of the earth. Since the Gymnosperms comprise only about 450 living species, it is evident that the Angiosperms are the chief modern representatives of seed-plants. Angiosperms may be said to be the most advanced, the most recent, the most conspicuous, and the most useful of plants. It is among Angiosperms also that the true flowers are developed, with elaborate relations with insects for securing pollination. The group is often called "true flowering plants," because it is characterized by the ordinary conspicuous flower. The two great divisions of Angiosperms are the Dicotyledons and Monocotyledons. The Dicotyledons are characterized by the lateral cotyledons, the organization of the woody bundles of the stem into a hollow cylinder, the open venation (often called "net-veined"), and the five- or four-parted flowers. To this group belong such forms as the common trees (poplars, oaks, elms, etc.), buttercups, roses, peas, umbellifers, heaths, mints, composites, etc. It was once supposed

that the Monocotyledons are the primitive Angiosperms, but more recent investigations, particularly in vascular anatomy, have shown that the Monocotyledons are an offshoot from the Dicotyledons. The latter group, therefore, is the main stock of Angiosperms, including not only the most primitive Angiosperms, but also the most advanced. The Monocotyledons are characterized by the single terminal seed leaf (cotyledon) of the embryo, the scattered woody bundles of the stem, the closed venation (often called "parallel veined"), and the three-parted flowers. To the group belong such forms as the common pondweeds, grasses, palms, aroids, lilies and orchids.

Angiosperms are of every possible variety of habit, from minute floating forms to gigantic trees. The roots, stems, and leaves are more elaborately and variously organized for work than those of any other plant group, and the whole structure of the body is the most complex found in the plant kingdom.

It is among the Angiosperms that "stamens" and "carpels" become definite and distinctly developed. The stamen of the Angiosperm corresponds to a spore-bearing leaf of the fern-plants, but shows no resemblance to an ordinary leaf in form. The region devoted to producing the spores is called the "anther." In observing the development of an anther it is found that four sporangia usually appear, and that as these approach maturity they fuse in pairs, resulting in the appearance of two pollen-sacs, each of which has been derived from two sporangia. Occasionally in Angiosperms the four original sporangia of the stamen remain distinct.

The carpels of Angiosperms give name to the group inclosing the ovules that become seeds, the name "angiosperms" meaning, as has been said, 'seeds in a case.' In this regard they differ decidedly from any carpels which exist among the Gymnosperms, in which group they are flat and

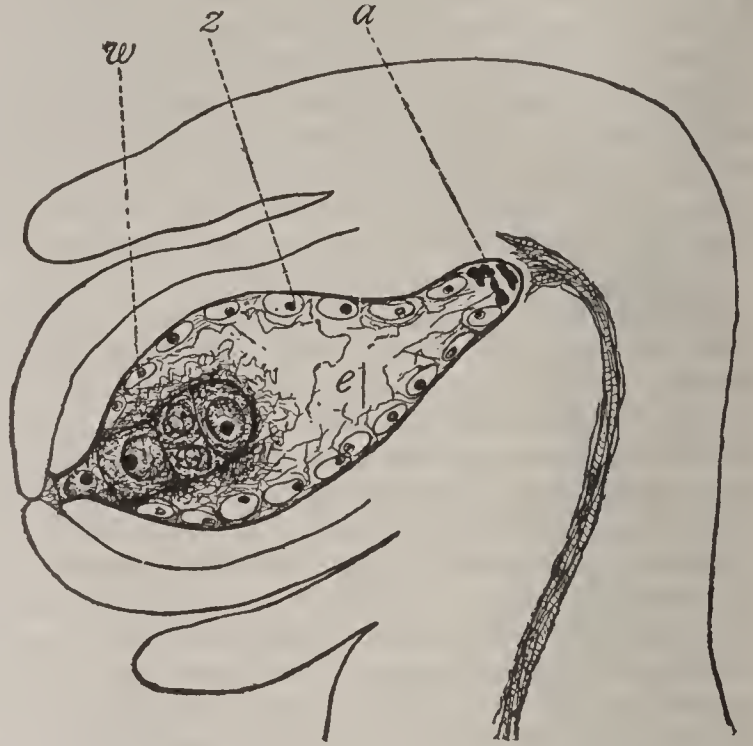


A mature embryo sac (*e*), showing the three antipodal cells (*a*), the two polar nuclei fusing to form the endosperm nucleus (*p*), the two synergids (*s*), the egg (*o*), and the pollen tube entering to discharge its sperm cells. The two integuments (*i*) of the ovule are also shown.

open, exposing the ovules, and giving rise to the name, which means 'seeds naked.'

In order to understand the following statement of the technical characters of angiosperms, it will be necessary to read the articles ALTERNATION OF GENERATIONS, and HETEROSPORY.

In its germination the pollen grain (*microspore*) produces within itself usually three cells, which represent a very much reduced male plant. One of these cells later develops the pollen tube, which penetrates to the egg, while the other two cells are the sperms. The embryo sac within

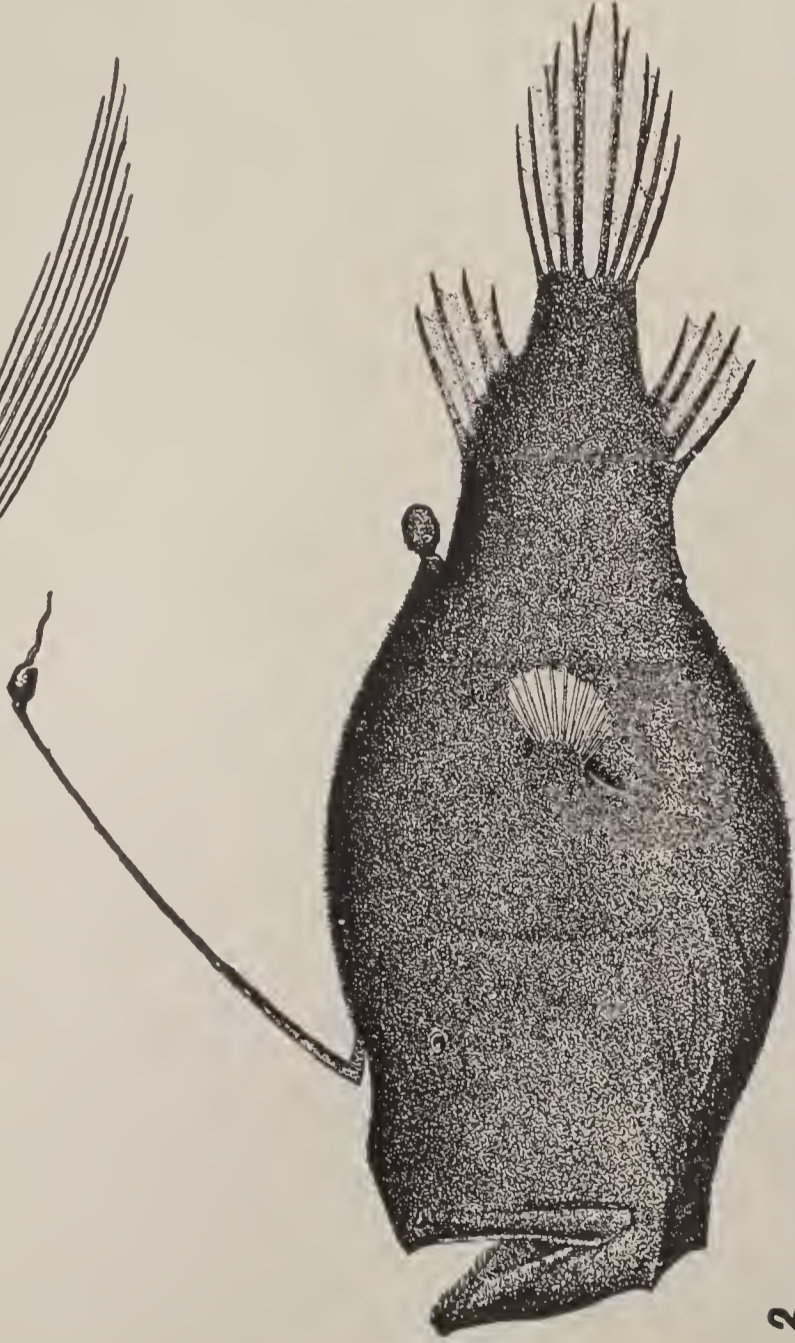
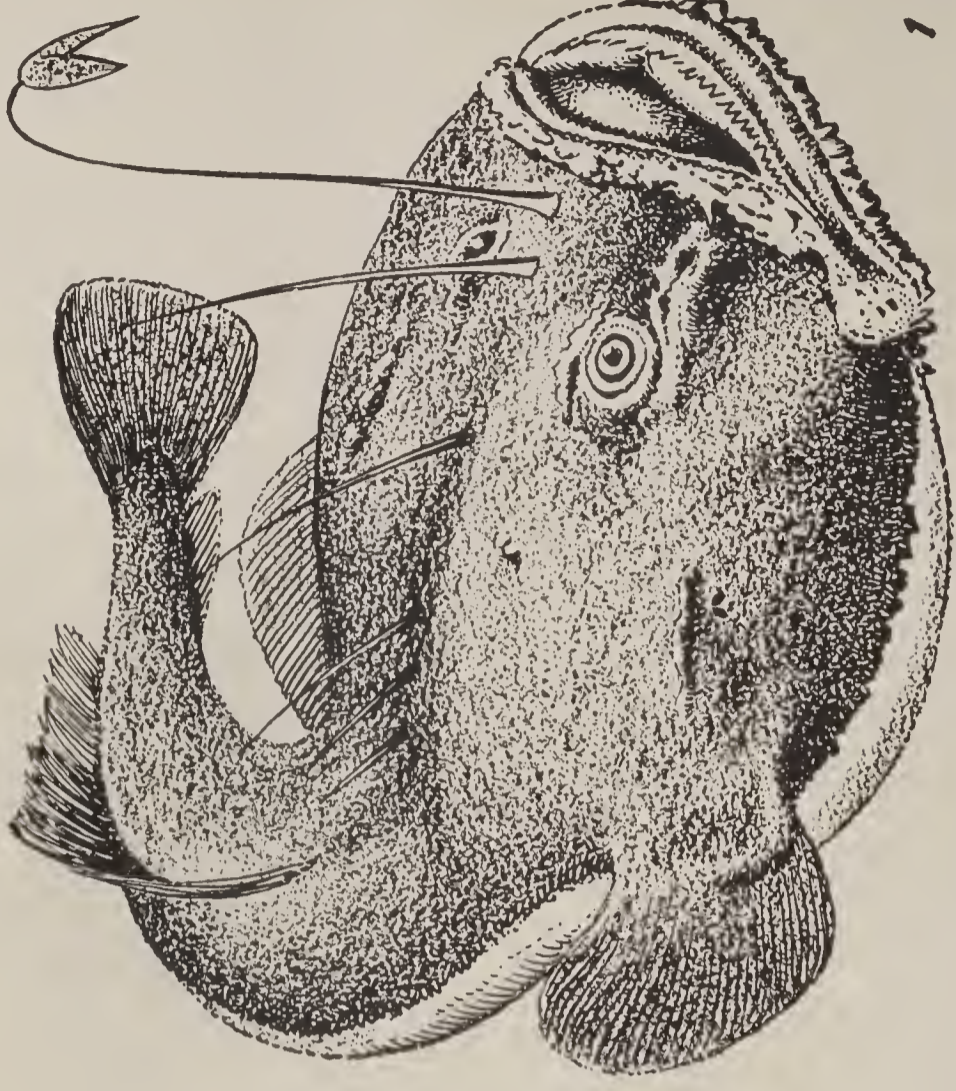
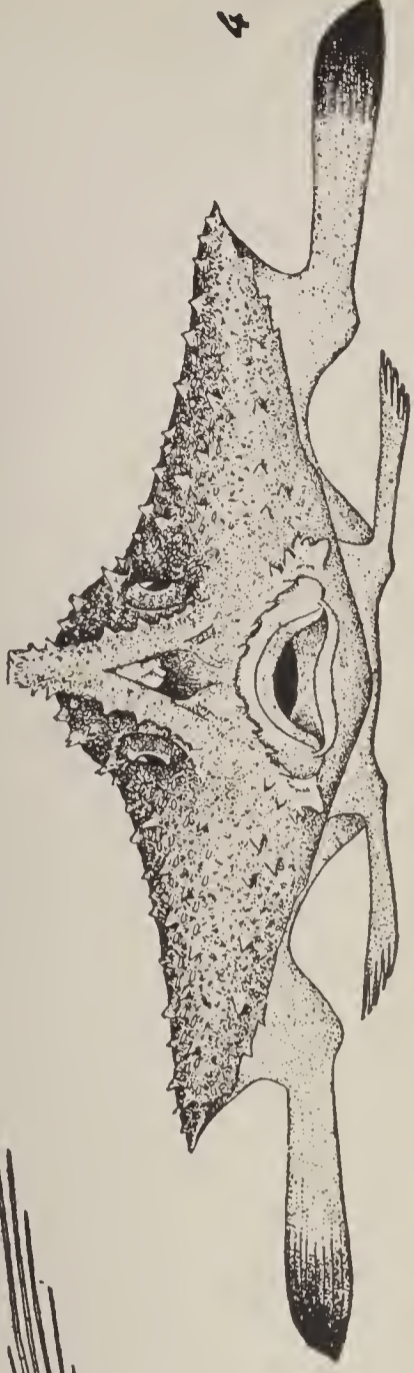
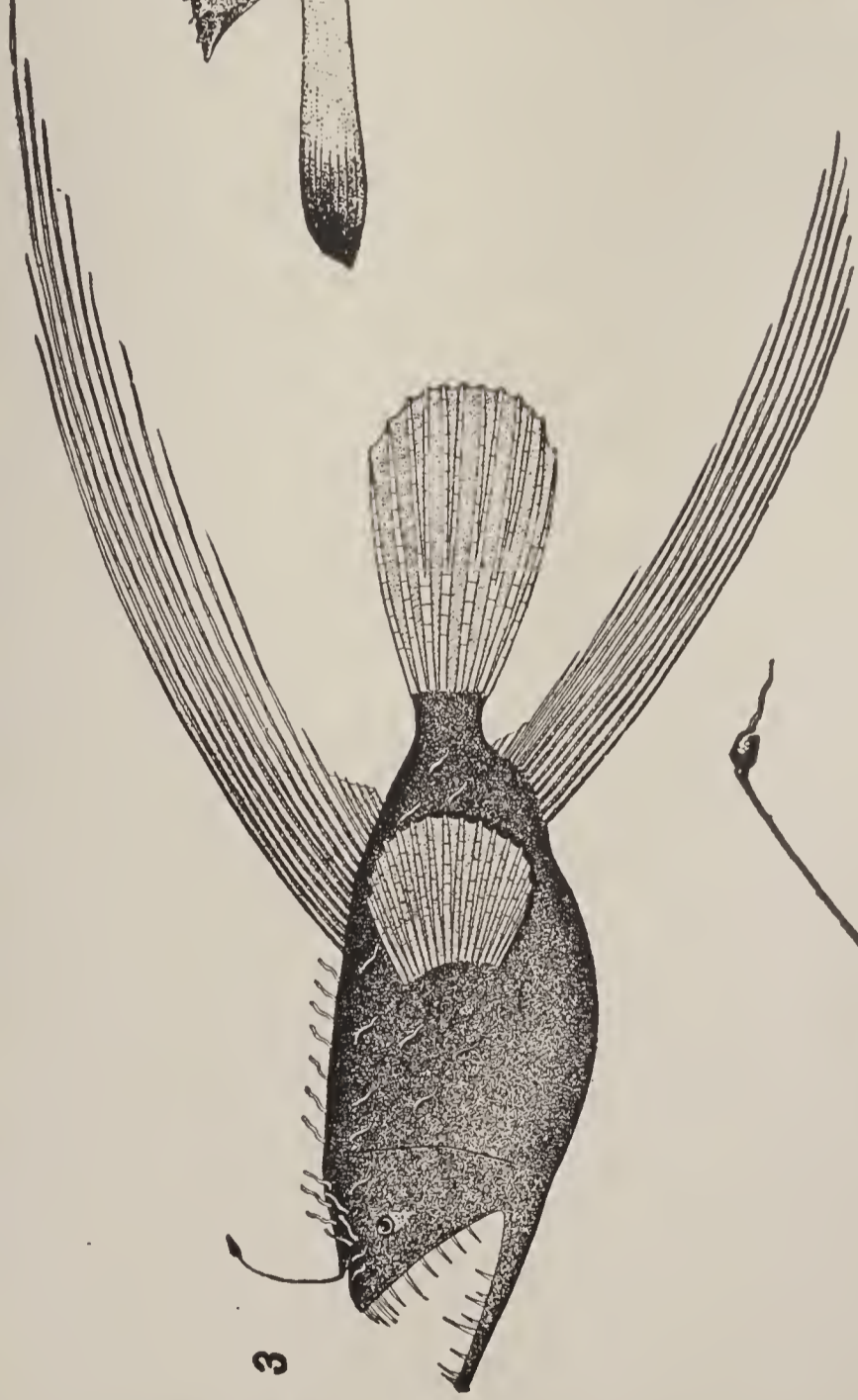


An embryo sac (*e*), showing the young embryo (*w*), endosperm cells (*z*), and the three disorganizing antipodal cells (*a*).

the ovule, which represents a single unshed spore, produces within itself a group of cells, usually seven in number, which represent a reduced female plant. In the end of the sac toward the micropyle (the opening left by integument) the single egg is situated, and associated with it are two other cells called *synergids* (helpers). This group of three cells is called the egg apparatus. At the opposite end of the sac is a group of sterile cells, usually three in number, called the antipodal cells. More centrally placed in the sac is the seventh cell, that has been formed by the fusing of two cells, and, after the fertilization of the egg, is to develop the endosperm (nutritive tissue of the seed). This cell is called the "definitive nucleus" or "primary endosperm nucleus." Before fertilization, the pollen grain containing the male plant is transferred by the wind or by insects to the stigma (receptive region of the pistil), the process of transfer being called pollination (q.v.). After pollination the pollen tube is developed, which penetrates the pistil and finally reaches the ovule, carrying in its tip the two male cells or sperms. The tip of the tube then enters the micropyle, crowds its way to the egg, and discharges its contents. One sperm passes to the egg and fuses with it, this act being called fertilization. The other sperm fuses with the endosperm nucleus, which therefore becomes a triple fusion nucleus. The occurrence of two fusions with the male cells in the embryo sac has been called "double fertilization," but it is very doubtful whether the fusion of the male cell with the endosperm nucleus is to be regarded as true fertilization. In any event, it does not result in an embryo (a young sporophyte), but in a nutritive tissue (endosperm). Consult Coulter and Chamberlain, *Morphology of Angiosperms* (New York, 1903), and Coulter, Barnes, and Cowles, *Text-book of Botany* (New York, 1910).

ANGLAISE, ä'n'gläz'. An English country dance (*contredanse*), in 2-4, 3-4, or 3-8 time.

ANGLERS AND BATFISH



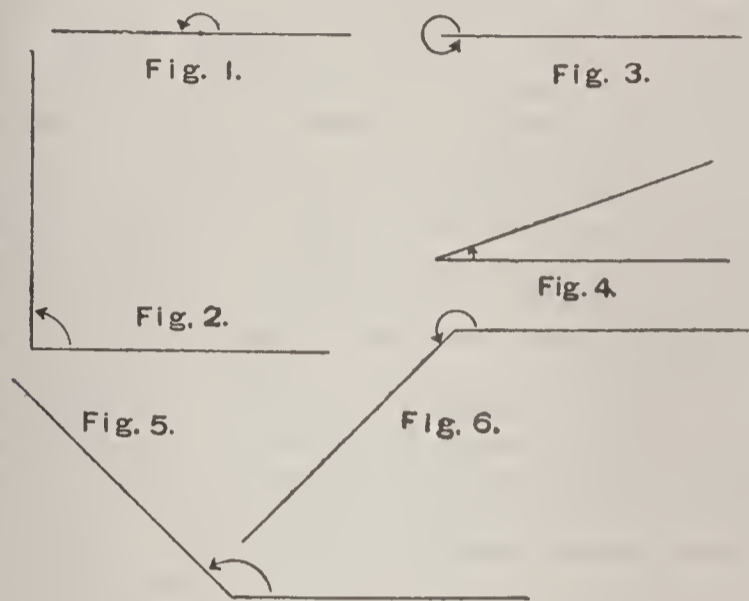
1. ANGLER OR GOOSE FISH (*Lophius piscatorius*).
2. DEEP-SEA ANGLER (*Caulophryne jordani*).

3. DEEP-SEA ANGLER (*Cryptosurus coquesii*).
4. BATFISH (*Ogcocephalus vespertilio*).

It is gay, and probably originated in the older form of the French *rigaudon*. See RIGADOON.

AN'GLE (Lat. *angulus*, a corner, Gk. *ἄγκυλος*, *ankylos*, bent). One of the common geometric concepts. If two lines meet, they are said to form an angle, the lines being called the arms, sides, or legs, and the point of meeting the vertex of the angle. The size of the angle is determined by the amount of turning necessary to carry a moving radius from one arm to the other, and hence is independent of the length of the arms.

If the arms of an angle are in the same straight line on opposite sides of the vertex, a



straight angle (Fig. 1) is formed; half of a straight angle is called a right angle (Fig. 2); two straight angles equal a perigon or angle of 360° (Fig. 3). Angles are also conceived exceeding 360° ; thus an angle of 720° is described when a screw is turned twice around. An angle between 0° and 90° is said to be acute (Fig. 4); one between 90° and 180° , obtuse (Fig. 5); one between 180° and 360° , reflex (Fig. 6). Angles are considered as positive if generated by a radius moving counter-clockwise, and negative if the radius moves clockwise. If the arms are straight, the angle is said to be *rectilinear*; if curved, *curvilinear*; if arcs of great circles on a sphere, *spherical*. Curvilinear angles have the same measure as the rectilinear angles formed by tangents to the curves at the vertex. If two planes meet, they are said to form a *dihedral* (Gk. two-seated) angle; this has the same measure as the rectilinear angle formed by two lines in the planes that are perpendicular to the line of intersection of the planes. If three or more planes meet in one point, they are said to form a *solid* angle, the measure of which is the ratio of the intercepted surface to the entire surface of any sphere having the vertex of the angle as its centre. A solid angle is *trihedral*, *tetrahedral*, etc., according as it is formed by 3, 4, etc., planes. For the various attempts made to define the simple concept angle, consult Schotten, *Inhalt und Methode des planimetrischen Unterrichts* (Leipzig, 1893).

ANGLE, FACIAL. See ANTHROPOMETRY.

ANGLE I'RON. See ROLLING MILLS, for a description of this and other steel shapes.

ANGLE OF EL'EVA'TION, ANGLE OF DEPARTURE, and other terms in Gunnery. See BALISTICS; GUNNERY.

AN'GLER (the name alludes to its seeming to "angle" for its prey; see below). A singularly ugly and voracious marine fish (*Lophius piscatorius*), also known as goose-fish, monk-

fish, all-mouth, and fishing-frog. It is of the order Pediculati, chiefly characterized by the greatly elongated carpal bones, which form a kind of arm supporting the pectoral fins. The angler is a large fish, 3 to 5 feet in length, having the large, flattened head with its wide mouth and projecting lower jaw, and the anterior part of the body, greatly out of proportion to the posterior tapering part. The three anterior spines have become widely separated from the dorsal fin, and shifted forward onto the head, where the most anterior is much elongated, barbel-like, and fleshy at the tip. It is by the brilliant color of this and other worm-like appendages about the mouth that the fish is said to attract smaller fishes and thus make them easy prey. The name "goose-fish" refers to the popular belief that it will seize geese and other swimming birds. As many as seven wild ducks have been taken from the stomach of a single fish. It is a very hardy fish and does not suffer from being out of the water as readily as most fishes. It occurs on the European shores, and on the American coast from Nova Scotia to the Barbados. Some deep-sea fishes of a closely related family (*Antennariidæ*) are sometimes included under the same name and apparently have similar habits. See FROG-FISH, and Plate of ANGLERS AND BATFISH.

ANGLER, THE COMPLEAT. See ANGLING.

AN'GLES. A Low German tribe who occupied the district of Angeln in Schleswig-Holstein and extended to the west as far as the North Sea. With the Jutes and the Saxons, the Angles passed over in great numbers to Britain during the fifth century, and settled in East Anglia, Northumbria, and Mercia. From them England derives its name (Lat. *Anglia*, AS. *Engla-land*). After these migrations from Schleswig, the Danes from the north entered the deserted districts and mingled with the Angles, who remained there. The German language and manners were afterward introduced by immigrant nobles from Holstein and prevailed among the higher classes; but until the nineteenth century the Danish was still generally spoken by the common people. During the nineteenth century the German gained the ascendancy. The modern Angles are said to be of a more passive disposition than the Frieslanders and the people of Ditmarschen, and religious sentiment is very strongly manifested among them. The district called Angeln extends from the Schlei on the south to the Flensburg hills on the north, contains about 330 square miles, and a population of about 38,000. The name has no political or administrative significance. Consult Erdmann, *Ueber die Heimat und den Namen der Angeln*: (Upsala, 1891). Kappeln is the chief town.

ANGLESEY, ăn'gl'sē, or **ANGLESEA** (AS. *Angles' ēg*, the Angles island). A county and island of Wales, separated from the mainland by the Menai Strait (Map: Wales, B 3). Its length is about 20 miles, breadth about 17, coast line about 80, area 276 square miles. The county is divided into three districts, called cantrefs, each subdivided into two cwmwds. The market towns are Amlwch (q.v.), Beaumaris (q.v.), the county town and a municipal borough (pop., 2231), Holyhead (q.v.), an urban district (pop., 10,636), Llangefni, and Llanerchymedd. Pop., 1891, 50,098; 1901, 50,606; 1911, 50,928. The surface is generally flat, and the soil of indifferent fertility and only partially cultivated, by far the largest part be-

ing under pasture. The principal products are wheat, barley, oats, and potatoes. The mineral deposits of the island are varied, but of less importance than formerly; in the latter part of the eighteenth century the Parys copper mines near Amlwch were considered the most productive in the kingdom. Other minerals that occur are copper, lead, silver, marble, limestone, asbestos, and coal. The island is connected with the mainland by one suspension bridge and the Britannia tubular bridge on the route of the Chester and Holyhead Railway. The island is traversed by two railway lines. There are still to be found some ancient relics of Druidism, which once flourished on the island. The Welsh language is largely spoken by the peasantry. Consult H. L. Jones, "The Mediæval Antiquities of Anglesey," *Archæological Journal*, vol. v (London, 1844).

ANGLESEY, HENRY WILLIAM PAGET, FIRST MARQUIS OF (1768-1854). A British general and statesman. He was educated at Oxford and entered Parliament in 1790. He commanded a volunteer corps in Flanders and acquired a high reputation as a cavalry officer in the Peninsular War. At the battle of Waterloo, where he commanded the British cavalry, he lost a leg. On his return to England he received a vote of thanks from Parliament and was made Marquis of Anglesey. In 1828 he was appointed Lord Lieutenant of Ireland at a period when that country was greatly agitated over the question of Catholic emancipation. This he at first opposed, but afterward advocated it, and in consequence was recalled by Wellington in 1829. He was again appointed to the same office under Lord Grey's administration in 1830; but his coercive measures destroyed his popularity, and he resigned his position in 1833. He founded the Irish Board of Education. In 1846 he was made field marshal.

ANGLESITE, ăn'glê-sīt. A lead sulphate that crystallizes in the orthorhombic system and occurs in white, light-yellow, green, and sometimes blue colors. It is formed as a result of the decomposition of galena and was originally found in Anglesea, England, whence its name; it also occurs in Cornwall, Derbyshire, and Cumberland; at various localities in the Hartz; in Hungary; and in the United States, at Phenixville, Pa., at various points in the Missouri lead mines, and elsewhere. Anglesite is useful as an ore of lead.

AN'GLEWORM. An earthworm, when used as fish-bait. See EARTHWORM.

AN'GLIA, EAST. A kingdom founded by the Angles before the middle of the sixth century, in the eastern part of central England, comprising the modern counties of Norfolk and Suffolk and equivalent in extent to the modern see of Norwich. It was somewhat dependent on Kent; but about 654 Anglia fell under the sway of Mercia and so continued till Egbert, King of Wessex, conquered Mercia and East Anglia in 825. Alfred the Great gave Anglia to the Danes under Guthrum in 878; but Edward, his son and successor, forced the Danes to acknowledge him in 921. Anglia soon became a part of the West Saxon kingdom.

AN'GLICAN. Belonging to the Church of England or to the other churches in communion with it, in Scotland, Ireland, the colonies, and the United States. The term is sometimes applied to the High Church party. See ANGLICAN COMMUNION; ENGLAND, CHURCH OF.

ANGLICAN CHURCH. See ENGLAND, CHURCH OF.

ANGLICAN COMMUNION. A term coming to be recognized as the semi-official title of the now world-wide body which is in communion with the Church of England as represented in its centre of unity, the see of Canterbury. It is only in comparatively recent years that this body has come to have anything like a concrete existence, which by the logic of events is crystallizing more and more, in contradiction though it be to the famous Branch Theory on which the claims of the body to be considered a part of the Catholic or Universal Church are based. Its component parts are the Episcopal churches of England, Scotland, Ireland, the British colonies, and the United States, with mission dioceses in various parts of the world. It coheres loosely by means of general agreement in worship and terms of communion, and as an integral body is represented by its bishops from all parts of the world in the Lambeth Conference at irregular intervals. Consult *Official Yearbook of the Church of England*; Tucker, *The English Church in Other Lands* (London, 1886).

AN'GLIN, MARGARET (1876—). An American actress, daughter of the Hon. T. W. Anglin, who at the time of her birth, at Ottawa, Canada, was Speaker of the Canadian House of Commons. After studying at the Empire School of Dramatic Acting (New York City), she made her début at New York in *Shenandoah* in 1894. Among her rôles were Roxane, in Richard Mansfield's presentation of *Cyrano de Bergerac* (1898); Mimi, in *The Only Way* (1899); Mrs. Dane, in *Mrs. Dane's Defense* (1900); Mabel Vaughn in *The Wilderness* (1901); the title rôle in *Zira* (1905); Ruth Jordan in *The Great Divide* (1906). In 1908-09 she went to Australia, where she appeared as Katherine in *The Taming of the Shrew* and Viola in *Twelfth Night*; and in 1910 at the Greek theatre, Berkeley, Cal., she played the title-rôle in a translation of Sophocles's *Antigone*. During the year 1911 she played in *The Rival* and *Green Stockings*. Consult Strang, *Famous Actresses of the Day in America* (Boston, 1899).

AN'GLING (AS. *angel*, fish hook, akin to Eng. *angle*, a corner, bend). The term "angling" has, by common understanding, become restricted to the catching of fish with a rod and line and chiefly as a source of recreation, while fishing may mean any method of taking fish, and frequently implies a commercial enterprise. The term "angle" and its cognate words in most languages are limited to the hook; but it is quite clear that in Anglo-Saxon the word includes as well the line and rod; a definition probably suggested by the position a rod and pendent line take when being used for bait fishing, at which time they form a right angle. Shakespeare refers to the angle in the sense of rod, line, and hook in *Antony and Cleopatra*, and he had good historic basis for selecting angling as a recreation in Egypt, for the mural paintings of the Egyptians make it clear that angling was a favorite pastime of their men of rank. So accurately is the spawning of fish described in the *Bundahish*, a Pahlavi work relating to the creation, as to suggest the existence of angler naturalists among the followers of Zoroaster. Both Greeks and Romans pursued angling for diversion's sake. Many allusions in classical authors justify the inference that the idea expressed by our word "sportsman" had defined

shape in antiquity. From Homer to Oppian there were piscatory poets, who dwelt on the exciting delights of the craft. Oppian's *Halieutica*, a poem of the second century A.D., treats of the natural history of fishes and of the fishing methods of the ancients. The perfect angler is herein defined as "a well-made, active man, patient, vigilant, enterprising, courageous, and full of expedients"; and his outfit is summed up in a couplet—

"The slender woven net, the osier creel,
The tapering reed, the line, and barbèd steel."

The earliest mention of fly-fishing occurs in the *Epigrams* of Martial, wherein is sung the rising of the wrasse "decoyed by fraudulent flies"; but Ælian, the author of a zoölogy, written about 200 A.D., gives a consummate description of this method of taking a certain species of trout as practiced by the Macedonians. From the angling pictures of Ausonius in the fourth century, there is, with the exception of a brief allusion in *Piers Fulham*, written about the year 1420, a break in the literature relating to this subject, until we reach the interesting work, *A Treatyse of Fysshynge wyth an Angle*, printed in England in 1496 as part of *The Book of St. Albans* (2d ed.) and therefore attributed to Dame Juliana Berners, though she could have had no part in its preparation, and it is most probably a compilation from an earlier work. It was published under the title *An Older Form of the Treatyse of Fysshynge wyth an Angle* in 1883. This treatise presents detailed instructions for the manufacture of tackle, gives faultless directions for fly-fishing, and describes minutely "xij flyes wyth wyche ye shall angle to ye thought & grayllying." The flies have been tied by a modern expert, in accordance with the directions given in the treatise, and they do credit to the taste of the first English authoress. Leonard Mascall's *A Booke of Fishing with Hooke & Line* (1590), the next work of importance in English, is largely a reproduction of the essay of the literary prioress. *The Secrets of Angling*, a delightful poem by John Dennys, appeared in 1613, and in 1651 Thomas Barker's *The Art of Angling*, the first work in which the reel is recognized as essential to success in the capture of large fish with rod and line. Two years later, Walton's *The Compleat Angler; or, the Contemplative Man's Recreation*, was given to the world. It was of this book that Charles Lamb wrote: "It would sweeten a man's temper at any time to read it; it would Christianize every discordant, angry passion." Angling is one of the richest departments of English letters. Westwood and Satchel's *Bibliotheca Piscatoria*, published as long ago as 1883, catalogues over 3000 works more or less concerning fish and fishing. To such as wish to understand the natural history of the objects of their pursuit as well as to master the various methods of capture, the following instructive monographs are recommended in addition to the volumes referred to in this article: G. B. Goode, *American Fishes* (New York, 1888); Seth Green, *Home Fishing and Home Waters* (New York, 1888); *The Angler Naturalist*, and the two volumes of the Badminton Library of Sports, entitled *Fishing*; Henshall, *Favorite Fish and Fishing* (New York, 1908); Aflalo, *Sunset Playgrounds* (London, 1909); S. C. Camp, *Fishing Kits and Equipment* (New York, 1910), and *The Fine Art of Fishing* (New York, 1911); Dimock, *The Book*

of the Tarpon (New York, 1911); Rogers, *Sport in Vancouver and Newfoundland* (London, 1912). See FLY CASTING; BAIT-FISHING; TROLLING.

ANGLO-CATHOLIC. A term used for the modern extreme high church party of the Church of England. The basis for the term is the claim that the Church of England is rightfully Catholic, not Protestant. Those who belong to the party use many of the customs and ceremonies of the Catholic church. The use of the term arose in the Oxford movement (q.v.).

ANGLO-IS'RAELITE THEORY. The theory that the English are descended from the Israelites, who were made captives by the Assyrians under Sargon (c.722 B.C.)—the so-called Lost Ten Tribes. The connection is made through Scythians and Saxons. The theory is destitute of scientific proof. For a defense of the view, consult M. L. Streator, *The Anglo-Alliance in Prophecy; or, The Promises to the Fathers* (2 vols., New Haven, Conn., 1900).

ANGLO-JAPANESE ALLIANCE. See JAPAN.

ANGLOMANIA (a hybrid formation from *Anglo*, English + Gk. *μανία*, *mania*, madness, frenzy, enthusiasm). A term which designates, in America and other countries, a weak imitation of English manners, customs, etc., or an indiscriminate admiration of English institutions. In German literature, an *Anglomania* was especially prevalent in the eighteenth century, when translations of English books became numerous and were read with great admiration. The Germans have ascribed the sentimental and affected style of some of their literature to the influence of the English literature of that century. A remarkable *Anglomania* prevailed in France for some time before the commencement of the Revolution. It arose out of political considerations and admiration of English free institutions, but extended to trifles even of fashions and manners, and often became very ridiculous. Since the garish court of the Third Napoleon has been replaced in France by the more sober régime of the Republic, *Anglomania* has replaced *Gallomania* with our fashionable set and has for some time been a fruitful theme of popular satire.

ANGLO-NORMAN LITERATURE, or ANGLO-FRENCH LITERATURE. Anglo-French is a dialect in which are mingled Old French, together with a blending of the Scandinavian language spoken by the followers of Hrolf, or Rollo (q.v.), who invaded the north of France and conquered it about 910. Anglo-Norman literature is that which was composed by the Normans in France or in England, and was equally admired by both. Many writers incorrectly say that it dates from the battle of Hastings (Senlac), but French had become well known to the courtiers of the Saxon court of Edward the Confessor, who preceded King Harold and who greatly favored the Norman-French scholars and poets whom he welcomed. French, indeed, was the language of love and poetry in England, as Latin was the language of scholarship, and it formed the reading of the aristocracy. It was not until the reign of Henry IV that an English language was definitely recognized, except among the peasants and such Saxons as held themselves aloof from Anglo-Norman influences.

Gaston Paris (q.v.) has given an interesting account of the French influence in England in

very early times (*La littérature française au moyen âge*). Certain it is that in the eleventh, and especially the twelfth, century Anglo-French was familiar to both the English and Normans and remained a spoken language until the seventeenth century, and even then it was still employed in legal documents.

How closely alike was the usage in both countries may be seen from the fact that some original manuscripts written in France are now to be found only in England, while many that were written in England are preserved only in France. The language, indeed, was expressive of the early English character—its gaiety, its daring, and its vivid imagination. The typical Englishman as we know him to-day did not come in before the Hanoverians. Prior to that time, as may be seen in Shakespeare and his contemporaries, the English were high-spirited, impulsive, rash, and full of vivid imagination. Only after the French element subsided, does one find the stolid, unemotional type that is choleric rather than full of passion. "Stodginess" was not an early English trait.

The different forms of composition in Anglo-Norman literature were highly varied, though many of the works themselves have not been preserved in the original, since they were transmitted orally. Among them we find historical documents, such as the *Roman de Rou et des ducs de Normandie* by Wace (q.v.), who also wrote a *Geste des Bretons* which is in the nature of history. This was imitated by Benoit de Sainte-More at the command of Henry II. Henry was a remarkable linguist. It was said of him that he knew something of every language spoken from the Bay of Biscay to the river Jordan. His patronage did much to cultivate literature in England and to encourage the development of learning. In his own day a swarm of unhistorical stories relating to the murder of Thomas à Becket sprang into existence and were widely circulated. A very great work of historical and social importance is the history of William the Marshal who was regent of England from 1216 to 1219.

In addition to histories (many of which were written in Latin) were the famous *chansons de geste* (q.v.) and *chansons d'aventure*, which also, like the *romans*, were sung and chanted rather than written down. It is a matter of record that the *Chanson de Roland* was chanted at the battle of Hastings. Among the most famous of love stories is that with which all the world is now familiar under the title of *Tristan and Yseult*, immortalized by Richard Wagner in what is probably the most famous of his operas, as it is one of the most famous romances of passionate love. In the Middle Ages, however, as told by Bérolf and Thomas, it had less vogue than at the present time. A vast number of didactic compositions have been collected and edited, such as lives of saints, works on orthography, bestiaries, psalteries, and *contes moralistes* that were told in the churches and may now be found in the variegated *Gesta Romanorum* (q.v.), which still makes its appeal, and of which Mr. W. D. Howells has written appreciatively in *My Literary Passions*. Translation from the Latin is represented by versions of Eutropius and the pseudo-Dares in the thirteenth century.

Lyric poetry is less frequent than one might expect, and most of it had its origin in France. The same thing may be said of epic poetry, which was popular enough in England but

usually originated in France. Some of the English epics have not even yet been printed and edited, as, for instance, the colossal work on Guy of Warwick. Gower (q.v.) wrote a number of ballads in Norman-French. The so-called *fabliau* is likewise more French than English. There is a volume of *fabliaux* compiled by Nicole Bozon about the year 1320. Much of the Alexander Saga, which at one time was widely read, is drawn from Anglo-Norman *fabliaux*. The French gift for neat and telling satire shows itself in the Anglo-Norman literature, the chief objects of attack being the clergy and women. As for the drama, no plays seem to have been acted in England prior to the fourteenth century; and the earlier English Moralities were drawn from French sources. In the thirteenth century there was written in Norman-French a mystery entitled *Adam*. For religious instruction there have been preserved 60 legends relating to the Virgin Mary, and also the famous *Poème de Marie et de Jésus*.

In the course of time the Anglo-Norman French of England naturally began to vary somewhat from the Norman-French of France. The Hundred Years' War did much to bring English to the front; yet even then a knowledge of French was esteemed the necessary accomplishment of a gentleman, and schools were founded in England for teaching the French language. Among these was Marlborough College, whose original purpose was the preservation and transmission of Anglo-Norman literature. Changes in pronunciation inevitably occurred, until at last Norman-French and Anglo-Saxon had blended into a new language which was thereafter to be known as English. The Reformation made a still deeper breach between France and England, though for a time the Catholic court of Scotland continued the Anglo-Norman tradition.

Bibliography. The present century is witnessing a very keen interest in the revival of Anglo-Norman literature, owing to the fact that the Romance languages are being studied so minutely. The French Société des Anciens Textes has made possible some very brilliant pieces of compilation and exegesis, especially in giving a free hand to Paul Meyer, an indefatigable worker in this fascinating field. He published and edited many texts of Anglo-Norman literature ranging from *lais* to *brutes*. His contributions to the periodical, *Romania*, are also notable. See also Brandin's *Introduction to Fulk Fitz Warine* (London, 1894). The collected papers of Meyer were published by the Société de l'Histoire de France (3 vols., Paris, 1891-1901). Note Schofield, *English History from the Norman Conquest to Chaucer* (London, 1906). Everything by G. Paris is memorable as giving brilliantly what may be called the environment of the Middle Ages in France and England. The work of Skeat, *Principles of English Etymology* (2d series, Oxford, 1891), which is valuable as well as popular; Behrens in Paul's *Grundriss der germanischen Philologie* (2d ed., 1897); L'Héricher, *Les Scandinaves en Normandie* (Paris, 1891); Groeber, *Grundriss der romanischen Philologie*, ii, iii (Strassburg, 1902); and Jusserand, *Histoire Littéraire du peuple anglais*, vol. i (2d ed., Paris, 1895), are indispensable. Compare the articles ENGLISH LITERATURE, FRENCH LANGUAGE, FRENCH LITERATURE, and NORMAN-FRENCH in the present work, with their appended bibliographies.

AN'GLO-SAX'ON ART. A term used to

describe whatever works of art were produced in England during the period of about six centuries between the time of the conquest by the Angles, Saxons, and other Germanic tribes and the time of the Norman conquest in the eleventh century. They found a combination of distinct Roman and Celtic art traditions, and were influenced by them, and subsequently by Christian art from Rome and Byzantium. Their originality was shown principally in their jewelry (especially the *cloisonné*) and arms, in which, however, they had borrowed what they knew from the Goths, whose works of the same kind were far more artistic. In architecture the Anglo-Saxons used principally wood, and relied entirely on foreign workmen for their rare buildings in stone, which were extremely plain, and this, which can hardly be called a "style," was influenced and partly superseded by the Norman style even before the Conquest. The Anglo-Saxons excelled in the illuminating of MSS., and in this they borrowed from the Irish Celts and in their turn assisted the Irish monks in teaching the Carolingian artists; for the great Anglo-Saxon monasteries sent masters to those in Gaul before and after the time of Alcuin.

Architecture. Of the stone churches, hardly a single one survives intact, those of importance having been reconstructed during the Norman or Gothic epochs. The stone masons, who were brought from Gaul and Rome in the seventh century to build the first stone churches, erected for Benedict Biscop the famous monasteries of Wearmouth and Yarrow; small parts of them remain. The little hall church at Bradford, entirely without columns, is almost the only complete structure remaining (705 A.D.). To about the same time belong the crypts at Ripon and Hexham. After these early works, which retain something of a Continental and Roman style, the later monuments of the ninth, tenth, and early eleventh centuries show an increase of Celtic peculiarities. The church towers have sometimes survived where the churches themselves have been renovated, and they form the most interesting group of Anglo-Saxon monuments, from such simple ones as that of Barton-on-Humber, through the more architectural examples at Barnack and Sompting, to the richer towers of Earl's Barton and Deerhurst. They are built of crude, irregular masonry—a few large blocks set in the midst of a mass of small stones. The corners are formed of long-and-short work, the high and narrow stones alternating with the flat, long ones bonded into the wall. In the more elaborate examples the surface is decorated with a series of vertical lines of pilaster strips occasionally joined by arched or gabled connecting strips and the few windows are sometimes arched, sometimes topped with two slanting straight pieces forming gables; while their jambs, or divisions (in two-light windows), are either pilasters or the peculiar baluster colonnettes not found except in this style. There are very few moldings and very little sculpture, none of it being figured. In fact, the style is so rude as hardly to rise to the dignity of art.

Illuminated Manuscripts. The Saxons were entirely without monumental sculpture or painting of native growth, and only their industrial arts are important. Even here they are inferior to the Goths in their jewelry, enameling, and goldsmith work, and to the Irish in their illuminating of manuscripts. Comparison with the

Book of Kells, the Gospels of MacKegol, and other Irish illuminations will prove this. It is true that the Gospels of Lindisfarne (British Museum) are equal to these works, but they were executed by Saxon pupils of the Irish monks. Another remarkably fine work is the Benedictional of St. Athelwold. In one particular the Saxon works are superior—in the treatment of the human figure, which in Irish works is a mere piece of decorative scroll-work without a trace of resemblance to the human form or real drapery. The influence of the pictures and illuminated MSS. brought to England from Rome and of the Byzantine MSS. gave the Saxons the advantage of good models for subjects of religious art, as is shown in such works as the Cuthbert Gospels (British Museum). There are three styles in Anglo-Saxon illuminations: (1) stage of Roman influence, seventh century, when the missionaries from Rome and Benedict Biscop gave Roman models (illustrated by the Golden Stockholm Gospels and the Psalter of St. Augustine, British Museum); (2) stage of Irish influence, with predominance of the geometric ornament of beautiful elaborate designs taken from textile fabrics, metal work, and conventionalized animal forms, seventh and eighth centuries (Durham Gospels, Gospels of St. Cuthbert, British Museum, Athelwold's Book of Prayers at Cambridge); (3) stage of reactive influence of Carolingian (Frankish) and Byzantine art, with re-introduction of figured composition and the placing of ornament in the background. This late development was rapid under the direction of SS. Athelwold and Dunstan, in the ninth and tenth centuries (Psalter of King Athelstan, British Museum; Missal of Leofric, Oxford; Gospels and Psalter of Boulogne; Gospels called "Bib. Greg." in British Museum; Cædmon, Oxford; Cotton Psalter, etc.). Certainly the peculiar interest of all the Saxon illumination lies in its immense initial letters and full-page geometric ornamentation, in which the artists rivaled the Irish in a field where neither Italian nor Byzantine illuminations had preceded them. They blazed a way which was followed by all subsequent illuminators in varying degrees; and for delicacy and precision of touch, judicious treatment of surface, and balance of composition, their geometric work has never been surpassed. In their good though simple color scheme one point is remarkable—that they never used gold leaf. In this they influenced Carolingian illuminators in direct opposition to the Byzantine style of profuse gold grounds and ornaments. In so far as similarities have been noticed in Scandinavian works, it is probable that they are due to influences from Great Britain rather than vice versa. When Charlemagne encouraged art, he found the British monasteries a great resource. The great Bible of St. Denis (British Museum) and the Leipzig Psalter are examples of this British influence on illumination among the Franks. During the last stage, when the geometric style was abandoned, extensive composition in pen-and-ink outline became a favorite method of illustration. Consult: Rickman, *An Attempt to Discriminate the Styles of Architecture in England* (London, 1848); De Baye, *The Industrial Arts of the Anglo-Saxons* (London, 1893); Akerman, *Remains of Saxon Saxondom* (London, 1853); Kemble, *Horæ Ferales* (London, 1863); Parker, *Introduction to the Study of Gothic Architecture* (London, 1847); Westwood, *Fac-*

similes of the Miniatures and Ornaments of Anglo-Saxon and Irish Manuscripts (London, 1868); also volumes of the *Archæologia* (London, 1770 ff.).

ANGLO-SAXON CHRONICLE. There are really Anglo-Saxon chronicles, growing out of a common stock but differing more or less widely from each other, especially in their later entries. Of this four-fold chronicle there are seven manuscripts in existence, four of which (A, C, D, and E) may well be considered independent records.

The common historical material out of which these four have grown is taken from Cæsar's invasion of Britain to the year 892. It seems likely that the idea of a national chronicle to embody existing oral and written records was suggested by King Alfred. The impulse thus given by Alfred was continued under Edward in the official record of the Danish wars which in C and D extends to 915, in A to 924.

From 925 to 975 all the chronicles are very fragmentary, A ending about 1001 with a few local entries. From 983 to 1018 C, D, and E are practically identical, this section, in all probability, having been composed at Canterbury. C extends to 1066, D to 1079, and the last part is mutilated. E is continued until 1154, the later parts showing unmistakable evidence of the harsh Norman rule in the querulous tone and the growing ignorance of the language. Nevertheless, "our debt to it is inestimable."

ANGLO-SAXON LANGUAGE AND LITERATURE. The term "Anglo-Saxon" is employed, in popular speech and to some extent among scholars, to designate the language of the Germanic peoples in England before the coming of the Normans (1066). Such, however, was not the usage of those who wrote in the language. Alfred, Ælfrie, and others repeatedly called it *Englisc*, i.e., English. True, the expressions *Angli Saxones* and *Saxones Angli*, i.e., English Saxons, occur in mediæval Latin literature, but they were used to distinguish the Saxons in England from those on the Continent. It was not until the revival of interest in England's earliest history and literature, which dates from Camden's *Britannia* (1586), that the compound "Anglo-Saxon" made its appearance, to denote, without any reference to their Continental kinsmen, the entire English people and their language. This designation was generally followed by historians and philologists down to 1875. Since then an increasing number of them have adopted the usage of King Alfred. To the earliest period in the history of the English language they have given the name "Old English." The term "Anglo-Saxon," it is argued, is misleading; for it seems to imply that our language before the Norman conquest was not English. It is, of course, admitted that the English language underwent great phonetic and inflectional changes in the twelfth and thirteenth centuries; and yet English has always remained English. On this continuity in the development of our speech, the proper emphasis is laid by the term "Old English." For this and other reasons, it has seemed best to treat the so-called Anglo-Saxon language and literature under ENGLISH LANGUAGE, ENGLISH LITERATURE, ANGLO-NORMAN LITERATURE AND NORMAN FRENCH.

ANGLO-SAXON LAW. The body of law of the Anglo-Saxons. It was not until the close of the nineteenth century that historical investigation made it possible to form even a toler-

ably clear conception of the legal system that prevailed in England prior to the Norman conquest. The earliest written records of that system are the Anglo-Saxon "dooms," or judgments, which go back to the sixth century of our era. From the time of Ethelbert of Kent to that of Edward the Confessor these records, though fragmentary, appear in an almost unbroken series, supplemented by land charters and wills, collected through the industry of modern scholars. These give us a far from complete, but yet a fairly consistent, idea of the principles and procedure of Anglo-Saxon law. This was, even at the time of the Conquest, a primitive law, concerning itself mostly with the personal relations of free and unfree men, liegemen and lordless men, or outlaws, with crimes of violence—homicide, wounding, and cattle-stealing—and with a simple and slowly developing law of real property. Contract law, as we understand the term, did not exist. There was no distinction between willful and accidental homicide or maiming, and all crimes were punished by the infliction of heavy fines, which were graduated, not according to the atrocity of the deed, but according to the personal status or dignity of the person injured. Indeed, the law of persons consisted almost entirely of a graded valuation of the individual's life or limb, and the terms "twelve-hundred-shilling man," "two-hundred-shilling man," were the well-understood equivalents of terms of rank or personal status.

Anglo-Saxon land law was a composite of Teutonic customary law and the rules growing out of the personal and property relations of lord and vassal, the former probably predominating. Folc-land (q.v.) was the name given to land the title to which rested on the common, customary, and unwritten law. Land derived by grant from the King was known as boc-land (q.v.), the title resting on the book, or written instrument, creating it. It is in the latter that the elements of a feudal form of tenure appear; but it is probable that all forms of tenure were more or less dependent; though of feudal tenure, in the strict sense of the term, there are only a few traces before the Conquest. The allodial ownership, referred to in the books, was not the "absolute and unqualified property" in land which Blackstone and other later writers had in mind when they used the term. Sometimes it is employed as the equivalent of boc-land, and more often merely as signifying an inheritable estate. See ALLODIUM; FEUDALISM; TENURE.

The Anglo-Saxon judicial system was of the loosest possible description. The public courts—the hundred court and the county court—were popular and local in character, and had no effective process for carrying their judgments into effect. There was no supreme judicial tribunal, no *curia regis*, such as developed in the Norman period; and when the king's justice was invoked to remedy an act of injustice committed by the regular tribunals, it was an irregular and extra-legal, or at least extra-judicial, power which he was called upon to exercise. Toward the close of the Saxon period a multiplicity of private courts sprang up, the predecessors of the courts-baron of a later date. See MANOR; COURT BARON; CURIA REGIS; KING'S BENCH. Consult: Pollock and Maitland, *History of English Law* (2d ed., Boston, 1899), for a brief but comprehensive description; Lee, *Historical Jurisprudence* (New York, 1900); Holmes, *The Common Law* (Boston, 1881); Chadwick, *Studies in*

Anglo-Saxon Institutions (Cambridge, Eng., 1905).

ANGLO-SAXONS. The collective name generally given by historians to the various Teutonic or German tribes which settled in England, chiefly in the fifth century, and founded the kingdoms which were ultimately combined into the English monarchy and nation. Various groups of them were known as Angles, Saxons, and Jutes. The traditional statement is, that the first of these invaders made their appearance in Britain in 449, having Hengist and Horsa as their leaders. But under the more searching scrutiny of later writers, these famous leaders have come to be looked upon as mythical heroes of romance, common to most of the Germanic nations; and though the fact of a great Germanic invasion in the middle of the fifth century is not doubted, it is believed that this was by no means the earliest period at which Germanic settlements were effected in England. Long previous to this period, a portion of the coast, extending from Portsmouth to Wells in Norfolk, was known as the *Litus Saxonium*; but whether in reference to Saxons by whom it was settled, or to roving adventurers of that race by whom it was ravaged, is still a subject of dispute. Of the three tribes mentioned above, the Jutes are stated to have been the first comers. Their earliest home was in what is now Schleswig, North Germany, and the portions of England of which they possessed themselves were Kent, the Isle of Wight, and the opposite coast of Hampshire. The Saxons settled chiefly in the southern parts of England—in Sussex, Essex, Middlesex, the south of Hertford, Surrey, the part of Hampshire not possessed by the Jutes; also Berkshire, Wiltshire, Dorset, Somerset, Devon, and the portion of Cornwall which did not remain in the possession of its former Celtic inhabitants. The Saxons who invaded England probably belonged chiefly to the portion of that great nation, or confederacy of nations, whose territories lay on the shores of the Baltic and about the lower Elbe, occupying a region corresponding to Holstein, the north of Hanover, and the west of Mecklenburg. Of the settlements of the third tribe we have little knowledge, until we find them established along the eastern coast of Britain. Some recent historians maintain that they were Enger-Saxons, from the lower Weser; but they were probably Angles (q.v.) from Schleswig, a corner of which is at the present time called *Angeln*; it is certain that they made a succession of descents on the coasts of Suffolk and Norfolk, on the country to the north of the Humber, and on the southern part of Scotland between the Tweed and the Forth. From these coasts they made their way inland, and eventually obtained possession of the whole of England, except the portions already mentioned; that is to say, of all the part to the north of the Avon, on the one side, and the Thames on the other, Essex, Middlesex, and part of Hertford excepted. The union of different bands of these conquerors among themselves, with their countrymen who had preceded them, and with the Celtic population which, though conquered, there is no reason to suppose was exterminated, gave rise to the so-called Heptarchy, the kingdoms of Northumbria (originally Bernicia and Deira), Kent, Sussex, Wessex, Essex, East Anglia, and Mercia.

The various independent states into which England had till then been divided were united

by Egbert, King of Wessex, in 827, into one kingdom. The royal family of Wessex, which was thus raised to the kingly dignity over the whole country, never again lost its supremacy till the Norman Conquest, except during the periods from 878 to 958, when the Danes ruled the kingdoms north of the Thames, and from 1016 to 1042, when Danish kings ruled over all of England. Indeed, all the later rulers of England, except the four kings of the Norman house, have been descended from the same line. Alfred the Great was the most famous king during the Saxon period. The whole ruling race eventually came to be known among themselves from the most numerous element in it, the English, and their land as Angle-land, or England. The Celtic races in Wales, Scotland, and Ireland, however, have always known them as Saxons.

Christianity was introduced among the newcomers in the latter part of the sixth century by missionaries from the Christian Scotch and Irish, to the northward, and at about the same time by St. Augustine, a missionary sent by Pope Gregory I, and by his companions and successors. Augustine became the first archbishop of Canterbury; the Roman missionary movement gradually superseded the Celtic, and before the close of the seventh century the whole of England was a Christian country under one metropolitan. Ethelbert, King of Kent, was the first sovereign who embraced the Christian religion. Bringing with them the traditions and feelings of the Empire, the whole influence of the clergy was thrown into the scale of monarchy and greatly tended to its consolidation. Their custom of holding councils of prelates from all over England, and of adopting regulations for the English church at large, also exercised a strong influence on the growth of a feeling of national unity. The English clergy in general were not very submissive to the authority of the popes, and the connection with Rome was a very tenuous one during the whole of the Anglo-Saxon period. St. Dunstan was probably the most famous churchman of this period. The early English church was distinguished for the learning and laboriousness of its clergy. Bede is the most eminent author whom it produced. Between his time and that of Alfred, a very great degeneracy had taken place both in the learning and efficiency of the clergy which that active and enlightened sovereign labored to restore, but with only partial success. St. Boniface and many other English and Scottish missionaries labored with success in the propagation of Christianity in Germany.

The monastic system took strong hold on the Anglo-Saxons, and a number of Benedictine abbeys were founded and endowed with extensive landed possessions. Most of the bishoprics which were to remain the permanent administrative divisions of the English national Church were organized, and the primacy of the two metropolitan sees of Canterbury and York was acknowledged.

The political organization of the Anglo-Saxons before they were united under one government is almost unknown, and must have been exceedingly crude, probably being scarcely developed beyond tribal conditions. After the union under the West Saxon monarchy, however, they attained a considerable degree of constitutional development. The most marked characteristic was the large amount of power possessed by local assemblies, or *mōts*. The township existed

as an economic and administrative, but scarcely as a political, body. The political unit of the country was the *hundred*. It was a certain stretch of country or a certain body of the population whose members met from time to time for various public functions, principally judicial. The significance of the numerical expression applied to it is quite unknown. There was an official known as the *hundred's caldor*, who seems to have presided at the hundred-mōt and exercised certain police functions. Just as a group of townships made up the hundred, so a group of hundreds made up a *shire*, the later *county*. The inhabitants of the shire also held a meeting, the shire-mōt, at which judicial cases were settled as well as at the hundred-mōt, but it seems to have existed more normally for fiscal and military purposes. The able-bodied men of the shire when called out for fighting purposes were known as the *fyrd*. The administrative and military head of the shire was the *caldorman*, called later, in imitation of the Danish term *jarl*, the *earl*. An equally important if not so exalted official of the shire was the *shire-reeve* or *sheriff*, the representative of the king's power and interests in the shire, as the ealdorman was the representative of local independence and self-government.

At the head of the whole system of government was the king, although ordinarily he took no important political action except in conjunction with the *witan*, that is to say, the great men of the country—the prelates, the ealdormen, members of the royal family, and various royal officials. The gatherings of these magnates to determine, along with the king, on important affairs of the nation, was called the *witenagemot*, and was the direct predecessor of the royal council of the Norman period and of the House of Lords of later times. The authority of the kingship was increasing through the whole Anglo-Saxon period, and in the hands of a vigorous king overrode all limitations by the *witan*; although in case of inefficiency or doubtful succession, the latter body exercised a real power of deposition and selection. The form of election and popular acceptance was always carried out.

In early times a fundamental distinction of classes existed. The *ceorl* class were the great body of the people; the *eorl* class were the nobility by blood. The term *eorl* is not to be confused with *earl*, mentioned above, with which it has no historical connection. This distinction of classes was reflected in the amount of the money-fine imposed for murder or other violence, the payment to the injured person or to his relatives being greater in case he were of *eorl* rank than if he were *ceorl*. Members of the royal family were known as *æthelings*. Below all these classes were the *theows*, or slaves. Another distinction which seems to have grown up later and superseded the division into *eorl* and *ceorl*, was one dependent on military service or personal relationship to the king or other great man. A *gesith* or *thegn* was a personal follower of a powerful man, who usually obtained land and privileges as a result of service. Ultimately, *thegn* seems to have become a general expression for any member of the class of gentry who was not known by the higher title of earl, ealdorman, or ætheling. See WITENAGEMOT.

Bibliography. Green, *The Making of England* (London, 1883) and *The Conquest of*

England (London, 1884); Ramsay, *The Foundations of England* (London, 1898); Stubbs, *Constitutional History of England*, vol. i (Oxford, 1903); Turner, *History of the Anglo-Saxons* (London, 1799–1805); Chadwick, *Studies in Anglo-Saxon Institutions* (New York, 1905), and *Origin of the English Nation* (Cambridge, 1907). For a fuller bibliography, see Gross, *Sources and Literature of English History* (London, 1900). See ENGLAND.

ANGOL, àn-gōl'. Capital of the department of Angol, and of the province of Malleco, Chile, 70 miles southeast of Concepcion (Map: Chile, C 11). It is on a branch railway extending 45 miles southward to Traiguén. In the sixteenth century it was sacked by the Indians and was rebuilt by Mendoza. Pop., 1885, 6331; 1895, 7056; 1903, 7896.

ANGOLA, àn-gō'là (Portug. for the native name *Ngola*). A Portuguese colony in West Africa, extending from 6° to 17° S. lat. and from 12° to about 25° E. long. (Map: Africa, F 6). It is bounded by German Southwest Africa on the south, Northern Africa on the east, and Belgian Congo on the east and north. Its coast line on the Atlantic extends for about 1000 miles, and its entire area, including the small possession of Kabinda, north of the Congo, is 490,463 square miles. The surface is very mountainous in the west, where some of the peaks reach an altitude of about 8000 feet. In the interior there is an extended range of mountains. The coast line forms a great number of harbors, the most important of which are São Paulo de Loanda, Lobito, Benguela, and Mossamedes. The rivers are mostly short and usually dry up during the arid season. The most important and only navigable streams are the Kuanza and Kunene, both flowing into the Atlantic. Temperature varies considerably, owing to the uneven formation of the surface. Rainfall is heavier in the northern part and in the vicinity of the coast than in the south. The agricultural products of Angola consist of manioc, coffee, bananas, sugar-cane, tobacco, and cereals. The land is held mostly in very large plantations by the Portuguese, and the condition of the native farm laborers is very close to actual slavery.

The trade is principally with Portugal. The chief articles exported are coffee, rubber, ivory, wax, and fish. The imports consist mainly of food products and textiles. The value of the imports and exports in 1909 was \$3,097,351 and \$2,999,856 respectively. The principal port is São Paulo de Loanda, commonly called Loanda, the capital of the colony, with a very considerable shipping. There is a railway from Loanda to Ambaca (225 miles), and thence about 75 miles to Malanje. A line from Lobito Bay is under construction toward the Katanga copper mines near the Rhodesia frontier. The total length of railways, as reported in 1913, was 642 miles. The telegraph lines of Angola had a total length of 2688 miles, with 69 offices, in 1911. Post offices, 453. The finances of the colony are in a rather strained condition, in spite of heavy taxation. The budget for the year 1909–10 showed estimated revenue of \$1,272,269 and estimated expenditure of \$1,698,546. For administrative purposes the colony is divided into six districts, which are controlled by the Portuguese government, but the greater part of Angola is under the rule of native chiefs. At the head of the colony is

a governor, appointed by the Portuguese government. The population is estimated at 3,800,000, mostly of Bantu-Negro stock. The number of Europeans is comparatively small, only about 4000; but they have exercised a great modifying influence on the native population inhabiting the western part of the colony as regards their customs and economic condition. The aborigines in the interior have retained their ancient institutions intact. The authority of Portugal in the western part of Africa was first established by the Portuguese explorer, Diogo Cam (Cão), who visited the estuary of the Congo (c.1482). Very little, however, was done by the Portuguese government to extend its rule farther inland, and in the middle of the sixteenth century it was almost entirely superseded by the Dutch. Gradually, by definite treaties, the Portuguese possessions in West Africa were extended to their present proportions.

Consult: J. de Vasconcellos, *As Colonias Portuguezas* (Lisbon, 1897); Châtelaine, *Angola* (Washington, 1893); H. W. Nevinson, *A Modern Slavery* (London, 1906); Mary H. Kingsley, *West African Studies* (London, 1901).

ANGOLA. A city and the county-seat of Steuben County, Ind., 41 miles north by east of Fort Wayne, on a branch of the Lake Shore and Michigan Southern, and the St. Joseph Valley railroads (Map: Indiana, D 1). Angola is the seat of the Tri-State College. The town was settled about 1834, incorporated as a town about 1866, and as a city in 1906. Pop., 1890, 1840; 1900, 2141; 1910, 2640; 1913, 2800.

ANGO'RA (ancient Gk. Ἄγκυρα, *Ankyra*; Lat. *Ancyra*; Turk. *Enguri*). The capital of the Turkish vilayet of the same name, in the mountainous interior of Asia Minor, and distant from Constantinople about 220 miles. The city is fabled to have been built by Midas, the son of the Phrygian Gordius. It was a flourishing city under the Persians; became the capital city of the Gallic Tectosages, who settled in Asia Minor about 277 B.C.; was a principal seat of eastern trade under the Romans, and was made the capital of the Roman province of Galatia Prima. It was the seat of one of the early churches of Galatia, and the scene of two Christian councils, held in 314 and 358. A temple of white marble, of exquisite workmanship, was erected by the citizens and dedicated to Rome and Augustus who had greatly beautified the city. In 1553 a Dutch scholar, Busbecg (q.v.), found in this temple a most important inscription, in two versions, one Latin, the other Greek, recounting the deeds of Augustus. This inscription is to be connected with a statement made by Suetonius (q.v.), in "Vita Augusti," 101, that Augustus left behind three *volumina*, one of which gave "a list of his exploits which he wished to have cut on brazen tablets which should be set up before his Mausoleum." The Latin inscription is a copy, more or less mutilated now, of the record set up at Rome in accordance with the will of Augustus. It was found on the wall of the vestibule, in six parts or pages, three to the right, three to the left of the entrance; the whole inscription is about 26 feet long by 8 feet high. The Greek translation was on one of the outer walls of the temple, and is about 4 feet high by 65 feet long. This Greek version is of very great value, because in many cases it supplements the breaks in the Latin original. The inscription was first printed in Schott's edition of *Aurelius Vic-*

tor (Antwerp, 1579), and has been edited by Mommsen (Berlin, 1883), Willing (Halle, 1897), and Fairlie, as vol. v, no. 1, of *Translations and Reprints from the Original Sources of European History*, published by the Department of History of the University of Pennsylvania (Philadelphia, 1898). Fairlie's book contains both versions and a translation. The text may also be found in Schuckburgh's edition of Suetonius's "Vita Augusti" (Cambridge, 1896). At Apollonia, on the borders of Phrygia and Pisidia, part of the Greek version has been found; this corresponds very closely to the Greek version found at Angora. Casts of the versions at Angora have, since 1882, been in possession of the Royal Academy at Berlin. Angora contains more than 30,000 inhabitants, of whom about one-third are Armenians. The district is famous for its breed of goats, with beautiful long silky hair. Of this goat-hair a kind of yarn is made, known as Turkish yarn or camel yarn, used in the manufacture of camlets which is extensively carried on in Angora itself. Many animals in this region are remarkable for the length and softness of their hair, especially dogs, rabbits, goats, and cats. This characteristic seems to depend upon a peculiarity of the climate, since this distinction disappears when the animals are transported to Europe. Consult Wright, *Cities of Paul* (Boston, 1905).

ANGORA CAT, GOAT, etc. See CAT; GOAT, ETC.

ANGORNU, ä'n'gôr-nōō'. See NGORNU.

ANGOSTURA, ä'n'gôs-tōō'râ. See CIUDAD BOLÍVAR.

ANGOSTURA BARK, or **ANGUSTURA BARK,** or **CUSPARIA BARK.** The aromatic bitter bark of certain trees of the natural order Rutaceæ and species *Cusparidæ*, natives of Venezuela and other countries of South America where it is used to combat periodic fevers. It derives its name from the town of Angostura, whence it is exported. It is said to have been used in Spain as early as 1759, as a remedy for weakness of digestion, diarrhœa, dysentery, and fevers. It is tonic and stimulant. The most important of the trees producing it, *Galipea officinalis*, grows upon the mountains of Colombia. It is a tree 12 to 20 feet high and 3 to 5 feet in diameter, having a gray bark, trifoliate leaves, with oblong leaflets about 10 inches long, and flowers about an inch long, in racemes, white, hairy, and fragrant. The bark contains a chemical substance called *angosturin*, *cusparin*, or *galipein*, to which its medicinal efficacy is ascribed. It is supposed that a variety of Angostura bark is produced by *Galipea cusparia* (called by some *Bonplandia trifolia*), a majestic tree of 60 to 80 feet in height, with fragrant trifoliate leaves more than 2 feet long. Angostura bark was formerly believed to be a valuable febrifuge; but it has been supplanted by quinine, and has, indeed, in some countries of Europe been prohibited, in consequence of its frequent adulteration with the poisonous bark of the *Strychnos nux vomica* (false Angostura bark), or the substitution of that bark for it.

ANGOT, ä'n'göt', CHARLES ALFRED (1848—). A French meteorologist, born in Paris. After the completion of his scientific studies he was for a time professor at the Institute of Agronomy, serving also as secretary-general of the Meteorological Society of France, and for many years as director of the National Bureau of Meteorology. He wrote much on meteorology and kindred

subjects, among his most important works being: *Traité de physique et de piles électrique*; *Traité élémentaire de météorologie* (1899); *Abrégé des instructions météorologiques* (1902).

ANGOULÊME, äŋ'gōō'lām'. The ancient capital of Angoumois, now of the department of Charente in France (Map: France, S., E 3). It is built upon a ridge, down the north slope of which straggle the quaint houses and crooked streets of the old town. The new town occupies the south slope. It is situated on an eminence between the Charente and the Anguienne, and among its industries are a number of paper mills and manufactures of machinery, wire, wine, brandy, woolen stuffs, linen, and earthenware. It possesses a royal college, a museum of natural history, a naval academy, a theological seminary, and a library. It is the seat of a bishop, and the cathedral of St. Peter dates from 1101. The founding of the see took place in 379, and Clovis built the earliest cathedral in 507. In the centre of the town stands the remnant of the ancient castle of Angoulême, in which was born Margaret of Navarre, the author of the *Heptameron* and other works. Pop., 1906, 37,507; 1911, 38,211. Consult: Castaigne, *La Cathédrale d'Angoulême* (Angoulême, 1834); Nanglard, *Fouille historique du diocèse d'Angoulême* (Angoulême, 1894-97); Babinet de Rencogne, *L'Histoire du commerce et de l'industrie en Angoumois* (Angoulême, 1878-79).

ANGOULÊME, CHARLES DE VALOIS, DUC D' (1573-1650). The illegitimate son of Charles IX of France and Marie Touchet. Until 1619 he was known as Comte d'Auvergne. He was imprisoned in the Bastille from 1605 to 1616 for having plotted against Henry IV. He was then released by Louis XIII and restored to his rank in the army, which he commanded at the siege of La Rochelle in 1628. He left some memoirs of the reigns of Henry III and Henry IV.

ANGOULÊME, LOUIS ANTOINE DE BOURBON, DUC D' (1775-1844). The eldest son of Charles X of France and Dauphin during his father's reign. He retired from France with his father (who was then the Comte d'Artois) at the beginning of the Revolution and spent some time in military studies at Turin. In August, 1792, he entered Germany at the head of a body of French *émigrés* and soon after retired to Edinburgh. In 1799 he married his cousin, Marie Thérèse Charlotte, daughter of Louis XVI, with whom until 1814 he lived in exile. On the recall of his uncle, Louis XVIII, he was appointed lieutenant-general of the kingdom; but he failed in his attempt to oppose Napoleon and was forced to capitulate. After the second restoration he was sent by Louis XVIII to the southern provinces to repress the political and religious outbreaks there, and in 1823 he led into Spain the French army, which put an end to the constitution and restored Ferdinand VII to absolute power. He was a man of phlegmatic disposition and mean abilities. When the Revolution took place in July, 1830, he signed, with his father, an abdication in favor of his nephew, the Duc de Bordeaux (Comte de Chambord); and when the Chambers declared the family of Charles X to have forfeited the throne, he accompanied him into exile to Holyrood, to Prague, and to Görz, where he died.

ANGOULÊME, MARIE THÉRÈSE CHARLOTTE,

DUCHESS D' (1778-1851). The daughter of Louis XVI. She exerted great influence over Louis XVIII and Charles X. She was imprisoned in the Temple with her parents, but in 1795 was exchanged for some French prisoners in the hands of the Austrians, and lived at Vienna till her marriage in 1799, with her cousin, the Duc d'Angoulême. Her memoirs were published in London (1852) with the title *Filia Dolorosa*, the editor being Mrs. I. F. Romer. Consult A. F. Nettement, *Vie de Marie de France, fille de Louis XVI* (3d ed., Paris, 1872).

ANGRA DO HEROISMO, äŋ'grà dô ä'rô-ēs'mô (Portug. bay of heroism). The capital of the Azores, a seaport at the head of a deep bay on the south coast of the island of Terceira, lat. 38° 38' N., long. 27° 12' W. (Map: Portugal, B 5). It is a station for ships between Portugal and Brazil and the East Indies, but the harbor, the only available one on the island, is very much exposed. It is the seat of the Portuguese governor-general of the Azores and of the bishop; is well built, but dirty; strongly fortified, and protected by a citadel at the foot of the Monte de Brazil; contains a military college and arsenal, several scientific and literary societies, a cathedral, and numerous churches. There is a considerable export of wine, fruit, honey, grain, and flax. This city furnished an asylum for the Portuguese regency from 1830 till the taking of Oporto by Dom Pedro (1833). Pop., 1911, 10,057.

ANGRA PEQUENA, äŋ'grà pã-kã'nyã (Sp. *pequeña*, little, small; see ANGRA). A settlement and a bay in German Southwest Africa (q.v.). Though poor its harbor is the best sheltered in the German possessions in that part of the continent (Map: Africa, F 7). The commercial importance of the bay has almost entirely disappeared on account of the lack of fresh water and the general barrenness of the surrounding country, although the climate is pleasant. The settlement of Angra Pequena was established by the Bremen merchant Luderitz in 1883, and it was the nucleus of the present German Southwest Africa. It was at Angra Pequena that the German flag was first planted on African soil in 1884. In honor of its founder, Angra Pequena is called by the Germans Luderitz Bay, and the surrounding country is known as Luderitzland.

ANGRI, äŋ'grê. A city in south Italy, 4 miles east of Pompeii (Map: Italy, F 11). It is situated in the mountains, has a castle and a park, and silk and cotton factories. South of the city, on the ancient Mons Lactarius, Teja, the last King of the Ostrogoths, was defeated by Narses in 553. Pop., 1881, 7700; 1901 (commune), 11,219; 1911, 11,574.

ÅNGSTRÖM, öŋg'strēm, ANDERS JÖNAS (1814-74). A Swedish physicist. He entered the University of Upsala in 1833; became privat-docent in physics in 1839, keeper of the astronomical observatory in 1843, and professor of physics in 1858. From 1867 till his death he was secretary to the Royal Society of Sciences at Upsala. He wrote on heat, magnetism, and especially on optics. Among his works were *Recherches sur le spectre solaire* (1869), in which he published his determinations of the wave lengths of most of the dark lines of the solar spectrum known as the Fraunhofer lines; *Sur les spectres des gas simples* (1871), and

Mémoire sur la température de la terre (1871). His best-known work, *Optiska Undersökningar* (1853), treats of the principles of spectrum analysis.

ANGUIER, ä'n'gè'ä', FRANÇOIS (1604-69), and MICHEL (1614-86). Brothers, prominent sculptors of the Baroque period. Both were born at Eu (Normandy); studied with Simon Guilain in Paris, and afterwards at Rome. The chief works of François are the mausoleum of Henri II, Duke of Montmorency, at Moulins (1651-58); figures from the mausoleums of Jacques Augustin de Thou and Jacques de Souvre, in the Louvre, and those of Gaspard de la Châtre and Henri Chabot, Duke de Rohan, in the Museum of Versailles. All of these works are in marble. At Moulins he was assisted by his brother Michel, who also carved many statues for the churches there. From 1654 to 1655 Michel was occupied with the plastic decoration of the apartments of Anne of Austria in the Louvre. His many sculptures include a bronze relief of the "Nativity," now in St. Roche, Paris, and a number of works in the Louvre, including a large terra cotta, "Hermes and Atlas." His masterpiece is the sculptures of Porte St. Denis, Paris, after the designs of Le Brun. The model of the grand staircase of the palace of Versailles is also attributed to him. One of the ablest sculptors of the seventeenth century in France, Michel Anguier united a fine sense of the antique with a strong decorative talent. Compared with his work, that of his brother François, although able technically, seems cold and labored. Consult the monographs on the brothers by Stein (Paris, 1899), the best upon the subject; others are by Sansom (Paris, 1889) and Duplais (Paris, 1890).

ANGUILLA, ä'n-gwî'l'lä, or LITTLE SNAKE (Sp. *Anguila*, ä'n-gè'l'lä; dimin. of Lat. *anguis*, serpent, snake). One of the British West India Islands, about 150 miles east of Porto Rico (Map: West Indies, Q 5). It is about 17 miles long and 4 miles broad, with an area of 35 square miles and a population of (1911) 4075, mostly negroes. The industries are cattle-raising and the production of vegetables, cotton, and salt, the latter obtained from a lake in the centre of the island.

ANGUISCIO-LA, ä'n-gwè'shò-lä, or **ANGUS-SOLA**, ä'n-gòò'sò-lä, SOPHONISBA (1527-c.1623). An Italian portrait painter. She was born at Cremona, of an ancient and noble family. Here she studied with Campi and Gatti, unimportant Eclectic painters, and imparted her own knowledge to five sisters, who also became painters. In later years she became blind, and it was then that Van Dyck visited her and professed himself enlightened by her conversations on art. Sophonisba's popularity was largely due to her personal charm and her wide culture. To modern ages her paintings seem mediocre. Of her portraits, which are to be found at Florence, Madrid, Genoa (Lomellini Palace), and in English private possession, the best known are the numerous portraits of herself, of which there are examples in the Uffizi and at Vienna. One of her best productions is her "Three Sisters Playing Chess" in the National Gallery, Berlin. Consult Fournier-Sarloveze, *Sophonisba Anguisciola et les sœurs* (Paris, 1900).

ANGUS, ä'n'güs, EARLS OF. See DOUGLAS, FAMILY OF.

ANGUS, JOSEPH, D.D. (1816-1902). A Baptist educator, born at Bolam, Northumberland, England. He was educated at the University of Edinburgh, and became president of the Baptist Regents' Park College, in London, in 1849. He was a member of the Bible Revision Committee, and is well known as the author of the *Bible Handbook* (London, 1854), *Handbook of the English Tongue* (1862), *Handbook of English Literature* (1868), *Handbook of Specimens of English Literature* (1866), and the commentary on Hebrews in Schaff's *International Commentary* (1883).

ANGUS, RICHARD BLADWORTH (1831-). A Canadian financier and capitalist. He was born at Bathgate, Scotland, and educated in the public schools. After being employed for several years in the Manchester and Liverpool Bank, he came to Canada in 1857, joined the staff of the Bank of Montreal, and became its general manager in 1869, holding that position for 10 years. He assisted Lord Mountstephen and Lord Strathcona in the reorganization of the St. Paul, Minneapolis, and Manitoba Railway, and, with them, was an influential member of the syndicate which completed the construction of the Canadian Pacific Railway in 1885. He became known as a munificent promoter of charitable institutions and of art.

ANGWANTIBO, ä'n'gwän-tè'bò. The slow lemur. See LEMUR.

ANHALT, ä'n'hält. A duchy of the German Empire, inclosed within Prussian territory (provinces of Saxony and Brandenburg), with an area of 888 square miles (Map: Germany, E 3). The western part, adjacent to Brunswick, partakes of the mountainous character of the Harz region and inclines gradually toward the valley of the Elbe. The latter traverses in a westerly direction the main part of the duchy and receives the Saale, Mulde, and a few minor tributaries. Anhalt has a fertile soil and is well cultivated. Rye, wheat, potatoes, oats, and grasses are grown extensively. The forests occupy a considerable area and belong chiefly to the state. The chief mineral product of Anhalt is salts of different kinds, which are worked exclusively by the government. The output of ore is very limited, while the production of lignite amounted to 1,266,369 tons in 1910. The manufacturing and mineral industries give occupation to over 47 per cent of the population. The chief manufactured products are metal articles, sugar, cement, bricks, soap and other toilet articles, leather, woodenware, and spirits. Exports are chiefly sugar, spirits, grains, salt, carpets, and matches. The railways of Anhalt have a total length of about 180 miles, chiefly state-owned. The constitution of the duchy vests the executive power with the duke, who is assisted by the Diet. The latter is composed of 36 members, elected indirectly for a period of six years. The immediate executive authority is vested in the minister of state. Anhalt is represented by one member in the Bundesrat and two deputies in the Reichstag of the German Empire. For purposes of local administration it is divided into six circles. The budget for the year 1912-13 balanced at 32,275,825 marks. The revenue is derived from taxes, customs, and state domains, mostly salt works. The military organization of the duchy is under the control of Prussia. Education, elementary as well as secondary, is well provided for by the state. The state re-

ligion is Protestant, but the Catholic and Jewish religions are also subsidized to some extent. According to the census of 1910, the population of Anhalt was 331,128, showing an increase of less than 5 per cent for the decade. Over 96 per cent of the population is Protestant. Capital, Dessau (q.v.).

The reigning house of Anhalt traces its origin to Albert the Bear, Margrave of Brandenburg, upon the death of whose grandson, Henry I, in 1252, the Anhalt territories of the family were divided into three parts, which gave rise to the related families of Bernburg, Aschersleben, and Zerbst. The subsequent history of Anhalt is a monotonous succession of reunions and reparcelings. All the parts were united between 1570 and 1586, and were then broken up again into four parts, Dessau, Bernburg, Köthen, and Zerbst. By the successive extinction of the last three lines, Anhalt was definitely reunited in 1863.

ANHALT-BERNBURG, -bĕrn'bŭrk, CHRISTIAN, PRINCE OF (1568-1630). A German general, founder of the Anhalt-Bernburg branch of Anhalt. In 1608 he took a leading part in the formation of the so-called Union of the Protestant German Princes directed against the encroachments of the Catholics. After acting as second commander of the army of that league, he entered the service of King Frederick of Bohemia, and led the army which was defeated by Tilly at Prague (1620).

ANHALT-DESSAU, -dĕs'ou, LEOPOLD I, FOURTH PRINCE OF (1676-1747). A Prussian field-marshal. He entered the Prussian service at the age of 12, and succeeded his father five years later. He distinguished himself at Höchstädt or Blenheim (1704) and in Prince Eugene's brilliant campaigns in Italy. After serving as a volunteer at Malplaquet (1709), he received command of the Prussian forces in the Netherlands, and aided Marlborough in his operations against Villars. In 1712 he was made field-marshal and military counselor to King Frederick I. Under Frederick William I Marshal Dessau aided in the reorganization of the Prussian army. As one of Frederick the Great's generals, he distinguished himself in the War of the Austrian Succession, in which he gained a bloody victory over the Austrians at Kesseldorf in 1745. To his soldiers Leopold of Anhalt-Dessau was known as "Der Alte Dessauer" ('Old Dessau'). Carlyle, in his *Frederick the Great*, speaks of him as "a man of vast dumb faculty, dumb but fertile, deep—no end of imagination—no end of ingenuities—with as much mother wit as in whole talking parliaments." There are numerous lives of him in Germany; the best ones are those of Varnhagen von Ense (Leipzig, 1872) and Crousaz (Berlin, 1875). There is an incomplete autobiography, edited by Hosaus, *Selbstbiographie des Fürsten Leopold*. Consult also Carlyle, *Frederick the Great* (London, 1858).

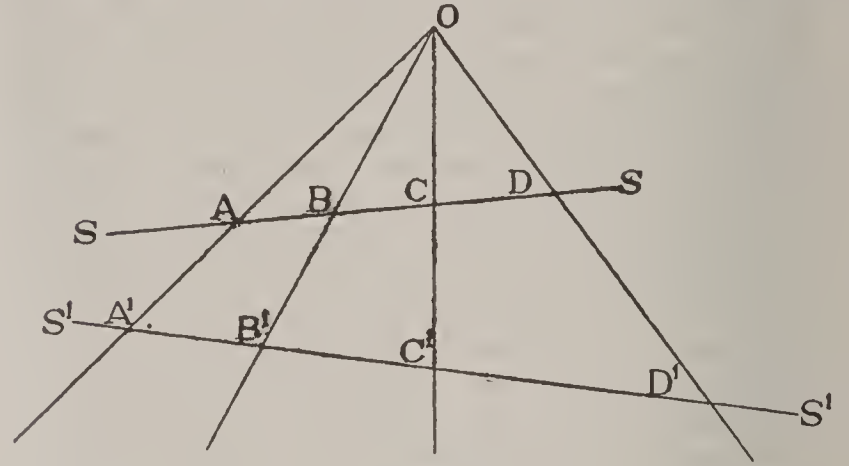
AN'HARMON'IC RA'TIO (Gk. *ἀν*, *an*, priv. + *ἁρμονία*, *harmonia*, harmony, agreement). An important form of ratio introduced by Möbius under the name *Doppelverhältniss* (double ratio), but called by Chasles *rapport anharmonique*. If a pencil of four lines with vertex *O* are cut by any transversal *SS* in points *A*, *B*, *C*, *D*, the ratio $\frac{AB \cdot CD}{AD \cdot CB}$ is called the anharmonic ratio of the points and also of the pencil,

and is symbolized by $\{O, ABCD\}$ or simply $\{ABCD\}$. Since $\frac{AB \cdot CD}{AD \cdot CB} = \frac{\sin AOB \cdot \sin COD}{\sin AOD \cdot \sin COB}$, the anharmonic ratio is the same for any transversal, such as *S'S'*, of given pencil, so that

$$\{ABCD\} = \{A'B'C'D'\}$$

This *invariance* with respect to projection and section is the fundamental property of the anharmonic ratio. All projective properties of geometric figures are expressible in terms of anharmonic ratios of their lines and points.

The anharmonic ratio $\{ABCD\}$ admits of certain interchanges of letters without altering



the value of the ratio. In fact, the 24 permutations of the letters give only six different anharmonic ratios, and these six are thus related: If $\{ABCD\} = \lambda$, then

$$\{ADCB\} = \frac{1}{\lambda}$$

$$\{ACBD\} = 1 - \lambda \{ABDC\} = \frac{\lambda}{\lambda - 1}$$

$$\{ACDB\} = \frac{\lambda - 1}{\lambda} \{ADBC\} = \frac{1}{1 - \lambda}$$

When the segments are so related that the value of the anharmonic ratio is -1 , the ratio is called *harmonie*. The subject of anharmonic ratio, as indicated above, plays an important part in projective geometry. Consult Cremona, *Elements of Projective Geometry* (London, 1885). See GEOMETRY.

AN'HIDROT'ICS (Gk. *ἀν*, *an*, priv. + *ἰδρῶς*, *hidrōs*, sweat). Drugs which check perspiration. They are chiefly used in the profuse night-sweats of phthisis. The most important are atropine, picrotoxin, agaricin, camphoric acid, sulphuric acid, and gallic acid (qq.v.).

ANHIMA, än'hĕ-mă (Brazilian name). The horned screamer, one of the curious South American birds of the order Palamedeiformes and the family Palamedeidae. See SCREAMER.

ANHIN'GA. A generic and native name in South America of the snake-birds, or darters (family Anhingidae). See DARTER, and illustrations on Plate of FISHING BIRDS (for similar species).

ANHOLT, än'hölt. An island belonging to the district of Randers, Denmark, situated in the centre of the Kattegat, about 22 miles from the peninsula of Jutland and the mainland of Sweden (Map: Denmark, E 2). Anholt Island has an area of 8 square miles, and is nearly twice as long as it is broad. At the eastern end is a lighthouse to mark the dangerous shoals and reefs of the neighborhood. Pop., 1906, 342.

ANHY'DRIDE (Gk. waterless, from *ἀν*, *an*, priv. + *ὑδωρ*, *hydōr*, water). An oxide which

combines with water to form an acid, or an oxide which combines with a basic oxide to form a salt. Sulphuric oxide (SO_3), when added to water (H_2O), forms sulphuric acid (H_2SO_4); sulphuric oxide is, therefore, termed the anhydride of sulphuric acid. Again, chromic oxide (CrO_3) combines with barium oxide (BaO), yielding barium chromate (BaCrO_4); chromic oxide is, therefore, classed as an anhydride.

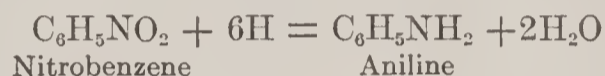
ANHYDRITE (Gk. *ἀν*, *an*, priv. + *ὕδωρ*, *hydōr*, water). An anhydrous calcium sulphate that crystallizes in the orthorhombic system. It is found crystallized, fibrous, finely granular, or scaly granular. A scaly granular variety from Vulpino, in Lombardy, Italy, takes a fine polish and has been used for sculpture. In America it is found in Lockport, N. Y., near Nashville, Tenn., and extensively in Nova Scotia.

ANI, ä'nê (native Brazilian name). A bird of the genus *Crotophaga*, inhabiting the warmer parts of America and related to the cuckoo. Three species are known, the most common of which (*Crotophaga ani*) is found in Florida, the West Indies, and Yucatan and eastern South America, where it is known as the "black witch," "savannah blackbird," and "rain crow." The anis are birds of medium size, about one foot in length, and have a black, lustrous plumage with blue and violet reflections. The tail contains only eight feathers, the smallest number credited to any living bird. The bill is exceedingly compressed, the upper mandible forming a thin crest. The nests are built in bushes, and the eggs are greenish overlaid with a white chalky substance. One species is said to be communistic, several individuals uniting to form a large nest, which they use in common, and the practice may be common to the tribe. The groove-billed ani (*Crotophaga sulcirostris*) is found from Arizona south to Peru and is named "el garapatero" because it accompanies cattle in the fields, settles on their backs, and picks from their hides the ticks which are called *garapatos*. For illustration, see CUCKOO.

ANICET-BOURGEOIS, ä'nê'sä' bōōr'zhwä', AUGUSTE (1806-71). A French dramatist, born in Paris. The splendid success of a melodrama, *Gustave, ou le Napolitain* (Gaité, 1825), which he wrote at the age of 19, induced him to follow a literary career. He soon became a collaborator with some of the leading authors of France, such as Lockroy, Decourcelle, Labiche, and Brisebarre. Among the vaudevilles and comedies produced in this way were: *Père et parrain* (1834), *Passé minuit* (1839), *Les trois épiciers* (1840), *Le premier coup de canif* (1848), *L'avare en gants jaunes* (1858), *Les mariages d'aujourd'hui* (1861). In conjunction with Barbier, Cornu, Lockroy, Masson, Féval and others he composed several melodramas, such as: *Le couvent de Tonnington* (1830), *Périnet Leclere* (1832), *La nonne sanglante* (1835), *Marceau, ou les enfants de la République* (1848), *La dame de la Halle* (1852), *L'aveugle* (1859), *Le bossu* (1862). His independent works include *La Vénitienne* (1834, one of his best efforts), *La pauvre fille* (1838), and *Stella* (1843). Anicet-Bourgeois was a master of dramatic technique and was unsurpassed in the field of the melodrama. He wrote in all nearly 200 pieces, many of which, however, were composed in collaboration with others, such as Dumas, for example, under whose name many of Anicet-Bourgeois's productions are still performed.

AN'ICE'TUS (?-168). A bishop of Rome from about 157 to 168 A.D. About 160 A.D. he conferred with Polycarp to determine the proper time for celebrating Easter, but they came to no agreement. Although it is not certain that he was a martyr, he is so called in the Roman and other martyrologies. He is commemorated as a saint by the Roman church on April 17.

AN'ILINE (from *anil*, Ar. *an-nil*, for *al*, the + *nil*, from Skr. *nīlī*, indigo), AMIDO-BENZENE, or PHENYL-AMINE, $\text{C}_6\text{H}_5\text{NH}_2$. A liquid organic substance extensively used in the manufacture of dyes. Pure aniline is colorless, has a faint, somewhat disagreeable odor, and boils at 183°C . All aniline ordinarily met with contains a thiophene derivative as an impurity, and it is owing to this that aniline rapidly turns red on exposure to air and light. The impurity is extremely difficult to remove, and really pure aniline, which remains colorless indefinitely, is best prepared by starting with benzene thoroughly freed from thiophene. Aniline combines with acids to form salts, such as aniline hydrochloride, $\text{C}_6\text{H}_5\text{NH}_2\cdot\text{HCl}$. It may be readily prepared by the reducing action of nascent hydrogen on nitrobenzene in acid solution, according to the following chemical equation:



On a large industrial scale aniline is made as follows: A small quantity of ground scrapings of soft iron castings, technically called *swarf*, is introduced, together with some water, into a large cast-iron still furnished with powerful agitators. Crude hydrochloric acid is then added, and nitrobenzene is allowed slowly to flow into the still; at the same time, through another opening, the rest of the swarf to be employed in the operation is allowed to flow into the still in a steady stream. After the first energetic action has subsided, the reacting mixture is heated with a current of steam introduced into the apparatus through several pipes. Six to eight hours suffice to transform all the nitrobenzene employed in one operation. The process may be called continuous, since the acid employed serves merely to start the reaction, and might, theoretically, be used in reducing an indefinite quantity of nitrobenzene, the reduction being effected by the iron and water. In reality, however, a portion of the acid remains combined as ferrous chloride, while most of the iron is transformed into its magnetic oxide, Fe_3O_4 , technically called *black stuff*. All the aniline brought into commerce is made in this manner.

Aniline was first discovered in 1826 by Unverdorben, among the products obtained in the destructive distillation of indigo. In 1834 Runge found it in coal-tar; in 1841 Zinin obtained it by reducing nitrobenzene with sulphuretted hydrogen, and in 1843 Hofmann effected the same reduction with nascent hydrogen, by the reaction of dilute acid and metals. The manufacture of aniline has been an important branch of industry since 1856, when the discovery of mauve was perfected by Perkin.

The qualities of commercial aniline adapted to certain purposes often contain, besides aniline, large quantities of other substances. Thus, crude "aniline for red" contains only about 25 per cent of aniline, the rest being ortho-toluidine and para-toluidine, compounds chemi-

cally allied to aniline. The presence of aniline in a substance submitted for analysis may be readily detected by dissolving some of the substance in water and adding a solution of bleaching-powder: in the presence of aniline an intense purple coloration is produced. Another test for aniline is afforded by the so-called carbylamine reaction: a drop of aniline added to a mixture of chloroform and a solution of caustic potash in ordinary alcohol produces an intensely nauseous smell, due to the formation of phenyl-carbylamine (phenyl iso-cyanide), C_6H_5NC . For bibliography, see COAL-TAR COLORS.

ANILINE COLORS. See COAL-TAR COLORS.

ANILINE POISONING. Aniline is a derivative of coal tar, in which it exists in small quantities, and is chemically the starting point of a host innumerable of compounds used in the arts and medicine. Aniline itself is a colorless liquid, which becomes brown on exposure to the air, constituting the commercial aniline oil. It has an aromatic odor and an acrid, burning taste. When taken in the liquid form or by inhalation, aniline is a very active poison, producing symptoms of headache, dizziness, cardiac and respiratory paralysis, loss of muscular power, cyanosis, convulsions, and coma. The fatal dose is about $1\frac{1}{2}$ drams. Externally aniline is irritating and gives rise to a troublesome form of eczema. Poisoning by this substance occurs, however, most frequently in the chronic form, among workers in aniline dyes (see COAL-TAR COLORS), either in their manufacture or in dyeing processes or in making inks. In medicine a great many aniline derivatives are used, notably the anilids, of which acetanilid, phenacetine, and antipyrine (qq.v.) are types. Several aniline dyes are also employed in medicine, among which may be mentioned methylene blue, an antiperiodic and urinary antiseptic; scarlet red, applied as an ointment to stimulate epithelial growth upon granulating surfaces; fluorescein, sometimes dropped in the eye for diagnostic purposes. Eosin and fuchsin are used in pathological laboratories to stain tissues and microorganisms. Aniline dyes are also largely employed to give an agreeable color to medicines. In whatever form these derivatives are absorbed their general effect is the same. They are cardiac poisons, and have a selective hemolytic action on the blood. The symptoms vary only in degree, according to whether they are slowly or rapidly taken into the body.

ANIMAL (Lat. a living being, from *anima*, current of air, breath of life, soul, *animus*, soul, mind; from the Skr. root *an*, to breathe). A representative of one of the two great groups of organisms, the other including plants. The distinction between animal and plant is hard to draw sharply, although the usual differences between the higher representatives of the two groups are obvious enough. Most higher animals differ from most higher plants in that their food is chiefly solid and organic, in their capacity for locomotion, in their alimentary tube, muscles, nervous system, and sense organs, in their limited growth and greater specialization of parts. This list of differences is really less formidable than it appears; it resolves itself chiefly into a difference of food, which demands that the animal shall seek the food and be provided with organs for locomotion (muscles, nervous system, and sense organs) and digestion. The difference in general

form of body is due to the different methods of getting the (dissimilar) food. This difference in food (solid and organic, as opposed to fluid and inorganic) serves in a general way to divide even the lower animals from the lower plants. But most animal and plant parasites are alike in requiring liquid, organic food; even green plants use organic food (some in large quantities, see SUNDEW), and all animals require inorganic food.

Locomotion is not a distinguishing characteristic of animals, first, because great groups of animals are permanently attached, viz., among protozoans, suctoria, sponges; among cœlenterates, most hydroids and corals; erinoids (sea-lilies); bryozoans, barnacles, and most ascidians. Single cases of attached animals are found in other groups. Secondly, bacteria, diatoms, oscillaria, certain unicellular green algae, and many plant "swarm-spores" are more or less locomotive. In respect to irritability there is little fundamental difference even between the higher animals and plants, for plants respond to the same agents as do animals, but less perfectly. The reproductive process is fundamentally the same in the two kingdoms. In their chemical composition the higher animals differ from most plants; for the former contain no cellulose, whereas the latter are largely built up of it. But cellulose is found also among animals, especially in the test of the tunicates. In their cell structure and cell physiology animals are almost indistinguishable from plants. The fundamental living substance, called protoplasm, is substantially alike in the two kingdoms, and it is probable that future studies will make dimmer rather than clearer the line separating them.

The principal functions of animals are connected with nutrition, locomotion, sensation, and reaction, reproduction, and relation to other organisms. Nutrition involves first the acquisition of food. Food is (1) inorganic—water, oxygen, certain salts; or (2) organic—either vegetable or animal, either dead or living, passive or active. Attached animals depend mostly on dead or on passive living organisms brought to them in currents of water. Those which live on active animals must have the most powerful organs of locomotion and sense. Solid food has to be triturated by teeth or crushing jaws and digested in a food canal. The fluids thus obtained pass through the wall of the food canal either into the general body spaces or into blood vessels, which carry them to the tissues, where they are assimilated or burned for heat and energy. When the food is exclusively fluid, it may soak through the body wall, as in tapeworms, which have no alimentary tract. The oxygen required passes through the wall of the body, is imbibed with water, or enters through special thin wall-tracts of the body surface known as gills or lungs. The body space or blood vessels carry the oxygen to the tissues, where it is used in combustion and in building up the organic compounds. The waste products of catabolism in the tissues are cast into the body spaces (or blood vessels) and eliminated, either directly or by special excretory organs. See ANATOMY; ALIMENTARY SYSTEM; RESPIRATORY SYSTEM; MUSCULAR SYSTEM, and similar articles.

Locomotion involves locomotive apparatus of divers kinds, jets of water, suckers and contractile tubes, lashes, tails, cilia, paddles, fins, wings,

and legs. It involves also muscles and a nervous system to control them.

All the protoplasm of the living body is irritable, but parts of the surface are told off as areas of special sense; for contact, hearing, taste, smell, sight, and temperature. To receive these impressions and to set in action appropriate movements, the central nervous system has become specialized. In the definite reactions which accompany particular situations to the world external to the animal lie the first evidences of a "psychic life." All sessile animals are characterized by lack of many sense-organs, reduction of muscular and nervous systems, and reduction of instincts.

Owing to accidents, the number of individuals tends constantly to diminish, yet it must be maintained. The single way that organisms have of making good losses or increasing their numbers is by dividing; this is the essence of reproduction (q.v.). Of especial significance is the fact that in all groups of animals the bits which have been constricted off (gametes) from time to time unite in pairs to form zygotes before going on with their development. In all reproduction the dividing individuals give rise to two incomplete individuals, except in the case where the division separates a "germ cell" from the body that carried it. The divided pieces or the germ cells are imperfect representatives of the species; they must "regenerate" or "develop" to produce the adult condition. See EMBRYOLOGY; REPRODUCTION.

The relations of animals to other organisms are varied. Many animals, especially in the higher groups, care for their young. Many protect themselves from their enemies by concealment or by flight; others are powerful for offense and defense. On account of the mating instincts, many higher animals have gained peculiar methods of appealing to the eye or ear or smell of other members of the species.

ANIMAL CHEMISTRY. See CHEMISTRY, PHYSIOLOGICAL.

ANIMAL COLORS. The chief animal colors now in use are cochineal, kermes, and lac dye (qq.v.). See also PURPLE.

ANIMALCULE (dimin. of Lat. *animal*, living being). A popular name originally applied to any small animal, but later restricted to microscopic organisms, particularly such as are found in water. The term has no scientific standing and is now little used except in compound names, such as *bell-animalcule*, *wheel-animalcule*, *bear-animalcule*, very different sorts of animals elsewhere described.

ANIMAL FLOWER. A sea-anemone or similar polyp, whose expanded colored tentacles resemble the petals of a blossom. For illustration, see SEA-ANEMONE.

ANIMAL HEAT. Heat generated in the animal body by oxidation of its tissues. In order to understand heat production, distribution, and regulation it is necessary to consider the animal body as a machine for converting potential energy, which is food, into the actual energy of heat and physical work, heat being merely a form of energy. The source of animal energy lies in the oxidation of its waste products, or, more specifically, in the conversion of proteids, fats, and carbohydrates into urea, carbonic acid, and water; and the only two ways by which this energy is liberated are as heat and mechanical labor. In the building up and repairing of tissue (anabolism) heat is ab-

sorbed and converted into its latent form, while during the process of breaking down (katabolism) heat is set free. The muscular system, in which these processes are very active, is obviously, then, the chief source of heat, and next in importance are the large secreting glands, such as the liver. Comparing the temperature of the blood as it enters the liver through the portal vein, with that as it leaves this organ by way of the hepatic vein, we find an increase of about 2° C., showing that the liver has raised the temperature to this extent. The blood itself is not an appreciable source of heat, but acts as an oxygen carrier and a distributor of warmth, bearing heat to the two great regulators of the body temperature, the skin and lungs, where dissipation takes place by evaporation; in the case of the skin, through the medium of perspiration. In animals like the dog, which do not perspire freely, respiration is the chief mechanism of heat regulation, and active exercise is attended by a correspondingly increased respiratory activity (panting). In human beings the skin is the chief regulator of body heat. The process of heat regulation is further controlled by certain areas in the brain and spinal cord, similar to those governing the vaso-motor system, these heat centres in their turn being stimulated or inhibited by afferent impulses from the surface, transmitted through the sensory nerves.

In man the average temperature is about 98.6° F. (36.8° C.), varying with circumstances, being somewhat higher after exercise or a hearty meal and at noon than at midnight. It differs slightly in various parts of the body, the interior being from ½° F. to 1½° F. higher than the surface. It also varies in diseased conditions of the body, rising to 106° F., or even 111° F. or 113° F. in sunstroke or heatstroke, and falling as low as 90° F. in cholera. A temperature of 108° F., if maintained for several hours, is almost inevitably fatal. In starvation a constant phenomenon is the marked fall of temperature, which becomes very rapid as death approaches. In most fish and reptiles, commonly termed "cold-blooded," the temperature differs but little from that of the water or air in which they live; the same is true in hibernating animals during the later part of their torpid condition.

Throughout the animal kingdom the power of generating heat bears a close relation to the activity or sluggishness of the animal. Many birds which are perpetually in action have the highest temperature (100° F. to 113° F.) and the swallow and quick-flighted birds higher than the fowls which keep to the ground. The higher the standard of animal heat, the less able is the animal to bear a reduction of its temperature; if that of a bird or animal be reduced 30° F. the vital changes become slower, and death finally ensues. Fish and frogs, on the other hand, may be enclosed in ice and still survive. Consult Kirkes, *Textbook of Physiology* (Philadelphia, 1907). See METABOLISM.

ANIMAL MAGNETISM. See HYPNOTISM.

ANIMAL PSYCHOLOGY. That department of psychology (q.v.) which has for its subject matter the description of mind as it is found in animals below man. It is frequently called comparative psychology, although that term is more properly reserved for the comparative study of the mind of animals including man. In general, the method of animal psy-

chology consists in the observation of the behavior of animals under various conditions, in the examination of their nervous structure, and in the interpretation, as indicators of mind, of the facts of behavior or structure or both in their relation to human behavior and structure. At first sight the observations of animal psychology appear to differ widely from the detailed verbal reports given in laboratory experiments upon the human subject; the difference is, however, more one of degree of precision than of kind. The special method of normal psychology is the method of introspection (q.v.). Introspection implies, on the part of the subject, observation and a report, and, on the part of the psychologist, an interpretation of the report on the basis of analogy between the psychologist's own mind and the mind which he interprets. The analogy may always be assumed to exist because the psychologist and his fellow being, whose mind he infers, are similar creatures, that is to say, their individual behavior and physiological structure are similar. In much the same way that the human subject introspects, the animal may be said to "observe," in that it clearly experiences certain phenomena, and to "report upon" these phenomena, in that it exhibits gross bodily movements subsequent to the experience. The flight of the deer at the sound of the hunter's gun may be regarded as no less a report upon experience than are the more refined movements of writing or speaking which constitute description by the human being. The difference lies in the accuracy with which the two reports may be interpreted. Gross bodily movements are much less precise and admit of much less specificity of meaning than do the movements involved in language, and the reliability of accurate interpretation on the basis of analogy to the human mind is decreased when there is greater diversity of bodily structure and general behavior between the animal and the human subjects. In the flight of the deer from the hunter, since this diversity is not so great, we may assume something not wholly unlike the human emotion of fear; in the flight of the infusorian from the drop of acid the likeness of conscious experience is much less probable. We may say, then, that the method of animal psychology is, in principle, the same as that of human psychology, but that the interpretation of data is much less precise, and that the degree of precision is least when the diversity of structure and behavior between the animal and man is greatest.

A very frequent resource in animal psychology of an earlier date is the anecdote. In the writings of Darwin and Romanes it forms the principal basis for conclusions concerning the animal mind. The anecdotal method is, however, open to serious objection, in that it does not distinguish carefully between fact and interpretation of fact; moreover, personal bias is not excluded, and superficiality of observation is not condemned. Washburn objects to the method on five grounds: "The observer is not scientifically trained to distinguish what he sees from what he infers. He is not intimately acquainted with the habits of the species to which the animal belongs. He is not acquainted with the past experience of the individual mind concerned. He has a personal affection for the animal concerned, and a desire to show its superior intelligence. He has the desire, common to all humanity, to tell a good story." Wundt

gives a specific instance of the error from Romanes's *Animal Intelligence*. "I have noticed," writes an English clergyman, "in one of my formicaria, a subterranean cemetery where I have seen ants burying their dead by placing earth above them. One ant was evidently much affected and tried to exhume the bodies; but the united exertions of the yellow sextons were more than sufficient to neutralize the effort of the disconsolate mourner." "How much," asks Wundt, "is fact, and how much imagination? It is a fact that ants carry out of their nest, deposit near by, and cover up dead bodies, just as they do anything else that is in their way. They can then pass to and fro over them without hindrance. In the observed ease they were evidently interrupted in their occupation by another ant and resisted its interference. The cemetery, the sextons, the feelings of the disconsolate mourner, which impelled her to exhume the body of the departed—all this is a fiction of the sympathetic imagination of the observer."

The obvious deficiencies of this anecdotal method have led to its almost complete abandonment in favor of the method of experiment. In 1883 Lord Avebury (Sir John Lubbock) published his experimental work on "Ants, Bees, and Wasps," and two years later Romanes reported experiments on cœlenterates and echinoderms. Many German investigators followed in the same path. The publication, in 1898, of Thorndike's *Animal Intelligence*, a book containing the results of experiments made under rigidly controlled conditions upon cats, dogs, and chicks, initiated a period of rapid development in experimental animal psychology and has been followed by a great body of researches into the behavior of various forms from protozoa to vertebrates.

A number of special experimental methods have been developed, particularly in the work upon vertebrates. The observation of structure and behavior have been supplemented by the observation of the alteration in behavior that takes place upon the extirpation of certain parts of the central nervous system or of the peripheral sense-organs. Methods of training have also been worked out. Animals have been required to associate food-getting with special conditioning factors, as color, shape, place. (See LEARNING IN ANIMALS.) The "puzzle-box method," originated by Thorndike, and the "maze method" have been widely utilized. In the former, the animal is required to let itself either out of or into a cage by undoing, often in a given order, a more or less complicated series of fastenings; in the latter, it learns to find its way without mistakes through a labyrinth. In either case the incentive may be hunger, in which event the animal is fed after a successful trial, or it may be desire for freedom or for the nest. In one form of the maze method the creature is punished by an electric shock whenever the wrong path is taken. Sometimes the method of extirpation and of training are combined, and the animal, after learning a problem, is subjected to operation in order to see what the effect may be upon the special association. Thus rats, which had learned a maze, were found to run the course almost as well after their eyes had been removed. An experimental lesion in the frontal lobes of the brains of monkeys was found to result in the loss of recently formed associa-

tions but not of those of long standing. Another method of training (Pawlow) consists in the formation of an association between some irrelevant stimulus and food, and the subsequent measuring of the strength of the association by the amount of salivary secretion that occurs upon the presentation of the originally irrelevant stimulus.

The advantages of the experimental are clear. The conditions are strictly controlled, the observer is impartial and is ordinarily trained in scientific observation. The method, however, presents the danger that the animal will not behave naturally in the surroundings of the laboratory. Fear and loneliness, as well as the extreme hunger used as a motive in some experiments, are not the natural circumstances under which the animal is accustomed to act. With the lower animal forms natural conditions can be fairly well approximated. For the higher forms "the ideal method," Washburn maintains, "involves patient observation upon a specimen known from birth, watched in its ordinary behavior and environment, and occasionally experimented upon with proper control of conditions and without frightening it or otherwise rendering it abnormal."

The tendency, evident in Darwin, Romanes, and their contemporaries, toward the more extremely anthropomorphic interpretation of the facts of animal behavior was the direct result of the Darwinian theory. The Cartesian notion of animals as automata could no longer suffice. From the point of view of the theory of evolution, which regards not only the entire physical structure of the human body, including the nervous system, but also the entire mental structure, which stands in intimate relation to the nervous system, as the result of a long period of development in the animal world, the demonstration of the pre-human mind becomes a necessity. As long as there was opposition to the theory of evolution, its adherents sought for evidence of human intelligence in animals; and this effort, coupled with the inevitable leaning toward anthropomorphic interpretation, led to an undue ascription of human faculties to animals. When, however, the opposition to Darwin's theory had abated, interest centred less in bridging the gulf between the animal and the human mind than in establishing a definite mental scale from the lowest forms up to man,—such a scale as the doctrine of evolution would naturally imply. It now became possible to formulate a principle of parsimony for the interpretation of observed data. Thus Lloyd Morgan laid it down as fundamental that "in no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale." It was, of course, the purpose of this principle, which has received quite general acceptance, to offset the obvious tendency to read human consciousness into the performances of animals. The chief argument against the principle seems to be that it is not necessarily implied in the method of animal psychology. "But what," says Lloyd Morgan, "it may be asked, is the logical basis upon which this principle is founded? If it be true that the animal mind can only be interpreted in the light of our knowledge of the human mind, why should we not use this method of interpretation freely,

frankly, and fully? Is there not some contradiction in refusing to do so? For, first, it is contended that we must use the human mind as a key by which to read the brute mind, and then it is contended that this key must be applied with a difference." The justification, it appears, is found in the doctrine of evolution. "Here evolution is postulated. The problem is this: Given a number of ascending grades of organisms, with divergently increasing complexity of organic structure and correlated activities: granted that associated with increasing organic complexity there is increasing mental or psychical complexity: granted that in man the organic complexity, the complexity of correlated activities, and the associated mental or psychical complexity, has reached the maximum as yet attained: to gauge the psychical level to which any organism has been evolved." Thus we assume, on the evolutionary hypothesis, greater simplicity of mind in the lower animal forms, and then adopt the principle of interpretation which is capable of giving results consistent with that premise.

We have seen that the method of animal psychology aims at a description of mind in conscious, living individuals. It presupposes the existence of mind. The question, however, is often asked: What is the criterion of mind? Does all life imply consciousness, or are mental processes first found only at some definite point in the biological scale? Various answers have been given. Some critics have maintained that there is no reliable evidence of mind in any animal, that animal psychology should therefore be abandoned, and that the behavior of organisms below man should be regarded merely as a group of physiological manifestations. Bethe, who, in his study of ants and bees, is an often-quoted expositor of this position, would explain all their complex activities by references to physiological reflexes and even deny them consciousness. More recently there has developed a study of animal behavior for its own sake, without regard to the characteristics of consciousness that the behavior implies; and not infrequently a "behaviorist" suggests that the consideration of mind in connection with the data of behavior is secondary to the real interest of the animal psychologist. Most students of animal activities, however, continue to ascribe consciousness to at least some creatures below man.

These latter investigators form two groups. The first group holds that not all animals are conscious, but only those higher forms which exhibit certain evidences of consciousness. The criterion of mind most usually accepted is the modifiability of behavior by experience. Both Loeb and Morgan hold this view. The former ascribes modification to "associative memory," which is "the fundamental process which occurs in all psychic phenomena"; if the animal can learn, that is to say, it has associative memory and therefore mind. The chief objection to such a position is that all animals and many inanimate objects alter their performance after being repeatedly acted upon by an outside agent. Washburn mentions the wood of a violin, which "reacts differently to the strings after it has 'experienced' them for 10 years." The implication of mind is evidently greatest when the modification occurs upon the first repetition of the experience; hence we may say that, when an animal *rapidly* alters its behavior upon the

repetition of a given situation, the evidence for consciousness is very strong. Loeb fails to find that the lower organisms satisfy his criterion for psychical processes, and explains their activities by reference to a purely physiological reaction, the tropism (q.v.), which is a response "brought about automatically or mechanically" by an agent acting directly upon the organism.

Jennings, on the other hand, discovers evidence of modification of behavior among even the lowest animal forms, and, in contradistinction to the theory of tropisms, attributes certain kinds of organic response to a method of trial and error. He maintains, however,—and it seems correctly,—that there is no real difference between Loeb and himself. The former has assumed a physico-chemical principle, the tropism, and has sought synthetically to build up therewith the simpler forms of behavior. Such forms as could not be synthesized he has missed. Jennings, on the contrary, has worked analytically from behavior down toward an equally mechanistic explanation, although in many cases he has not been able to push his analysis to the limit. Thus Loeb, working from both ends of the biological scale, denies mind to the lower animals, while Jennings, who works continuously down from above, admits its possibility. Now a criterion of the kind put forward by Loeb is, in general, open to the objection that it implies the discontinuity of a series, into which mind is introduced at one particular stage; in particular, the indefiniteness of the criterion actually chosen makes it again unsatisfactory. Since modification of behavior may occur anywhere in the scale, it cannot itself alone serve as the index of mind. If, on the other hand, we accept only such rapid alteration in behavior as will insure the presence of mental process, we find that we cannot even be assured of the existence of consciousness in those animals whose similarity of nervous structure to that of man makes the denial of mind an absurdity. Structure alone, we may add, cannot serve as a criterion, for it is continuous in its forms throughout the scale and affords no opportunity for the elimination of consciousness at any special point. The alternative, at present, then, seems to be to assume consciousness at all points in the biological scale—a notion, which is not inconsistent with the theory that certain of the earliest organic movements were conscious. See ACTION.

The results of experimental work upon the protozoa have shown that the mind of these lowest forms of animals must be of the very simplest. Yerkes observes: "The mind of the one-celled animals consists of a certain limited number of sense qualities, together with the feelings of agreeableness and disagreeableness. There is no sufficient reason for assuming that the animals experience ideas, memories, emotions, sentiments, thoughts, or any of the psychic complexes which have been observed in man. Theirs must be lives of simple awareness of certain features of their surroundings, without even the consciousness of self as distinguished from environment." Amœba, for example, is capable of but three, or at most four, different reactions. A weak mechanical stimulus, such as would be encountered in the ordinary movement of the animal, brings out a positive reaction, that is to say, the amœba pro-

ceeds toward the stimulus; a particle of food elicits a food-taking reaction, in which two pseudopodia are advanced and the food is engulfed; any other stimulus—mechanical, chemical, thermal, photic, galvanic—causes the negative reaction, in which the animal moves away from the source of stimulation. When suspended in water, the amœba throws out pseudopodia until one of them comes in contact with a solid body. There is no reason to suppose that a single reaction is accompanied by more than one sensory process, unless the positive reactions are attended by a vague agreeableness, and the negative, by a dim disagreeableness. At most, however, the consciousness of the amœba can hardly involve more than three or four simple experiences. There can scarcely be any reference to objects, any imagery, any memorial revival, or any ideas. See CHEMICAL SENSE IN ANIMALS; MECHANICAL SENSE IN ANIMALS.

In the lower metozoa—sea anemones, jelly fish, worms, crabs, etc.—we find an increased complexity of both structure and behavior; specific organs, including sense organs, appear; and the forms of reaction are more numerous and more highly differentiated. Consequently we may assume the presence of many more sense qualities than we allowed to the protozoa and the arrangement of these qualities into simple conscious patterns. Some observers would interpret the modification of behavior by experience, in certain of these creatures, as indicating the presence of imagery. Such an interpretation seems, however, to be exceedingly problematical. See IMITATION IN ANIMALS; MEMORY IN ANIMALS.

Among the higher invertebrates—the ants, bees, wasps, and other social insects—we find an exceedingly complex behavior, which, as we have noted, has been interpreted by some to imply a consciousness comparable with that of man. Other investigators have emphasized the instinctive character of the activities of these animals and have been content to consider the higher insects as mere automata. Still others take intermediate ground. The truth is that the insects represent a line of development divergent from the course of evolution that has culminated in man, and it is therefore difficult to describe the insect mind from the analogy of human consciousness. Either we may, because of the fixed character of behavior, assume that the performances of bees and ants are largely reflex and only infrequently conscious, or, on the basis of the relation between emotion and instinct in the human subject, we may attribute a very complex affective consciousness to these creatures. See ANT; BEE; INSECT, *Social Insects*; INSTINCT.

In the vertebrates below the mammals behavior is not so complicated as in the insects, but it indicates a mind more nearly of the human type. The birds and reptiles show some evidence of imagery. Among the mammals vastly more complicated consciousnesses appear; and Yerkes has compared the mind of the cat or dog to that of the human infant in its first year, and the mind of the highest apes to that of the human child in its first three years. In general, we may conclude from the mass of experimental evidence that the vertebrate consciousness is not unlike the human, in that it is characterized by complex patterns of a great variety of sensory and imaginal processes, often

affectively toned. The principal difference between the mind of man and the mind of other vertebrates seems to be that in the latter there is a predominance of sensory experience. Indeed the question has been raised whether any animals possess free ideas, that is to say, ideas referring to absent objects and not grouped about an immediate sensory core; and it is generally admitted that, if such ideas occur, they must be very infrequent. See animal articles on CHEMICAL SENSE; HEARING; IMITATION; LEARNING; MECHANICAL SENSE; MEMORY; VISION.

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ANIMALS, CRUELTY TO. See CRUELTY TO ANIMALS.

ANIMAL WORSHIP. See RELIGION.

AN'IMA MUN'DI (Lat. the soul of the world). The view that all the changes in phenomena are due to the operation of conscious beings, conceived on the analogy of human consciousness, was the result of one of the most primitive and most naïve attempts to solve the problems presented to experience by change and chance. (See MYTHOLOGY.) When the early philosophers in any race advanced from a belief in a multiplicity of presiding genii to a belief in a single ordering consciousness, which stands in the same relation to the world as a whole as the human mind stands to the human body, the doctrine of the *anima mundi* was reached. It has been held in various forms and has survived to quite recent times. Anaxagoras, who believed in a universal reason that gave form to the universe, was one of the first Occidental philosophers who held this doctrine. Aristotle escaped animism (i.e., the doctrine of an *anima mundi*) by holding that although Nature is a being in itself alive, God is separated from nature as a transcendent spirit. In the system of the Stoics the *anima mundi* was conceived to be the sole vital force in the universe; it usurped the office of pure spirit, and the doctrine became indistinguishable from pantheism. In modern times Agrippa of Nettesheim (1486-1535) revived the doctrine with a changed terminology, substituting *spiritus mundi* for *anima mundi*. Bruno, Paracelsus, Sebastian Franck, Boehme, Van Helmont, More, and Cudworth (see articles under these titles) have advocated similar views with varying terminology. See PANTHEISM.

ANIMÉ, an'i-mā or mē (of disputed origin). A variety of copal; a white, brittle mineral resin soluble in alcohol and used, to some extent, in the manufacture of sealing wax and of varnishes. See COPAL.

AN'IMISM (from Lat. *anima*, soul), the

belief in spiritual beings. The classical expression of the doctrine of animism, with reference to primitive peoples, was given by E. B. Tylor in his *Primitive Culture*. The idea of a spiritual double, according to Tylor, is first suggested to the mind of the savage by his dream experiences. In his dream he visits his friends and performs various acts, whereas the assurances of his mates convince him that his body has all the while been quietly at rest. These impressions are verified by certain observations during waking hours. The reflection in the water, faithful to its original but possessed of a strange independence; the shadow, ever present but also exhibiting ways of behavior all its own; the echo—all bespeak the presence of a double, modeled after the individual but only in part dependent on it and of a more fleeting and evasive nature. The ideas thus suggested are presently applied by the savage to the interpretation of sickness, coma, death. The possible importance of apparitions and hallucinations, in this connection, has been emphasized by Andrew Lang (*The Making of Religion*). Analogous experiences are responsible for the doubles of animals, plants, inanimate objects. Animism thus becomes a general philosophy of nature utilized by the savage in his attempts to interpret the animate and inanimate world that surrounds him.

The explanation of animism given by Herbert Spencer (*Principles of Sociology*, vol. i) differs somewhat from that presented above. Spencer's primary concern was with the human double, the origin of which he explained by considerations practically identical with those advanced by Tylor; he did not, however, apply the same argument to the rest of animate and inanimate nature, but populated it with human spirits.

The idea of a spiritual entity, as held by the savage, must not be conceived of as utterly devoid of all properties of matter. While free from some of the gross characteristics of objective nature, the soul or spirit is possessed of a certain tenuous substantiality, which makes it possible to prevent its escape from a body by closing all the exits, and which necessitates the presence of a hole, however small, if the spirit is to enter an object or a being.

While no sharp line is drawn in primitive thought between good and evil spirits, spiritual agents are almost universally made use of in the interpretation of disease. The sick man is possessed by a foreign spirit that has entered the body, perhaps during the absence of the patient's own double; and, if health is to be restored, the intruder must be removed. To effect this is commonly the function of the medicine man who, by rubbing, sucking, or striking, induces the disease spirit to leave the body, and presently produces its material embodiment in the form of a small pebble or some other small object.

The doctrine of animism, as an interpretation of savage belief, held absolute sway during the last third of the nineteenth century. Barring the speculative considerations adduced by Spencer and Tylor, an insight into the nature of primitive animism may best be secured by the study of such works as Theodor Koch's "Zum Animismus der südamerikanischen Indianer" (*Internationales Archiv für Ethnographie*, vol. xiii, Supplement) or Waldemar Bogoras' "The Chukechee," part ii, "Religion" (*Publications of the Jesup North Pacific Expedition*, vol. vii).

Since Tylor first proclaimed his minimum defi-

nition of religion as the "belief in spiritual beings," the problem of animism has often been identified with that of religion. In recent years serious objections have been advanced against the legitimacy of such identification. While it is true that all peoples so far investigated were found to profess both animism and religion, a belief in spirits does not *per se* involve a religious attitude. On the other hand, religious emotion may well be aroused by agencies and situations lying outside the domain of animism. See RELIGION.

Others have criticised the conception of a double. Lévy-Bruhl, in particular, has attempted to show that the prevailing belief among primitive tribes is in a multiplicity of spiritual entities or souls, whereas the belief in a double seems to have a rather limited distribution (*Les fonctions mentales des sociétés inférieures*; compare also Wundt's discussion of the soul in his *Völkerpsychologie, Mythos und Religion*, part i).

It has also been claimed in various quarters that the belief in spirits cannot be conceived of as really primitive, that there must have been a "pre-animistic stage," which knew no spirits but endowed nature with vague and undifferentiated magical powers which, while efficient, were also elusive and did not assume the form of individualized entities (Marett, Preuss, Hubert and Mauss, Lévy-Bruhl, Durkheim). Such magical powers are often designated by the Polynesian term *mana*.

The last 25 years have seen much careful and systematic research of savage beliefs. Of these studies was born the conviction that primitive animism ought not to be conceived as a philosophy of nature. Deliberate systematization of his experiences is foreign to the mind of the savage. What animism thus comes to mean is not that the savage conceived of spiritual entities behind all phenomena of objective nature, but that whenever he thought or felt in terms of causes, these causes were for him spiritual entities. His thinking and feeling, moreover, in this as in other connections, were spontaneous, unsystematic, often self-contradictory.

However that may be, animism must be regarded as the most common form taken by primitive beliefs, which have survived in the innumerable animistic superstitions of modern European peasants and, having traveled along the highways and byways of mental progress, still blossom forth in the churches, parlors, and garrets of civilization.

ANIMUCCIA, ä'nè-mōōt'chà, GIOVANNI (c. 1500-71). An Italian musician sometimes called the "Father of the Oratorio." He became maestro di capella of the Vatican in 1555. For the congregation of the Oratory, one of whose objects it was to render religious services attractive to young people, Animuccia composed the *Laudi*, which were to be sung at the conclusion of the regular office, and from which the oratorio is said to have developed. Several of his masses, magnificats, motets, madrigals, etc., have been published, and among these the following are a few of the most noteworthy: *Il primo libro di madrigali, etc.* (Rome, 1595); *Joannis Animucciae Magistri Capellæ Sacrosanctæ Basilicæ Vaticanæ Missarum Libri* (Rome, 1567); *Magnificat ad Omnes Modos* (Rome, 1568); *Il secondo libro delle laudi ove si contengono motetti* (Rome, 1570). See ORATORIO.

ANIMUCCIA, PAOLO (?-1563). An Italian

musician, brother of Giovanni Animuccia. He was one of the ablest contrapuntists of his time and occupied the position of maestro di capella at the church of San Giovanni in Laterano from 1550 to 1552. Many of his motets and madrigals were popular.

ANIO, ä'nè-ō, modern **ANIENE**, ä'nè-ā'nā, or **TEVERONE**. A river in central Italy, 69 miles long, which rises 44 miles east of Rome in the Sabine Mountains, forms famous waterfalls at Tivoli (q.v.), and then flows freely through the Campagna into the Tiber 2 miles above Rome. An aqueduct was built in 265 B.C., with the proceeds of booty taken during the war with Pyrrhus to carry water from Tivoli to Rome. The water power of the Anio is now converted into electric energy, which is transmitted to Tivoli and Rome. See AQUEDUCT.

AN'IONS. See ANODE; ELECTRO-CHEMISTRY.

AN'ISE (Lat. *anisum*, anethum, Gk. ἀν[ν]-ηθον, an[n]ēthon, anise, dill), (*Pimpinella anisum*). An annual plant of the family Umbelliferae. The genus *Pimpinella*, which embraces about 75 species, natives of the Old World, has compound umbels usually without involucre. One European species, adventive in waste places in the eastern United States, *Pimpinella saxifraga*, is known as burnt saxifrage or pimperl, and has no properties of importance. Anise is a native of Egypt and other Mediterranean regions. It is an annual plant; the stem is 1½ to 2 feet high, dividing into several slender branches; the lower leaves roundish, heart-shaped, divided into three lobes, and deeply cut; those of the stem pinnate, with wedge-shaped leaflets. The umbels are large and loose, with yellowish-white flowers. It is much cultivated in southern Europe, Germany, especially in the district around Erfurt, where a large quantity of the seed is annually produced, South America, India, etc. Attempts were made more than 200 years ago to cultivate it in England, but the summers are seldom warm enough to bring it to perfection. It is occasionally sown in gardens for a garnish or for seasoning. Aniseed is used as a condiment and in the preparation of liqueurs; also in medicine, as a stimulant stomachic, to relieve flatulence, etc., particularly in infants; and it has been used in pulmonary affections. It has an aromatic, agreeable smell and a warm, sweetish taste. It contains a volatile oil, called oil of anise, which is nearly colorless, has the odor and taste of the seed, and is employed for similar purposes. One hundred-weight of seed yields about two pounds of oil, which is obtained by distillation; but at Erfurt the oil is made from the stems and leaves.

ANI'SOPHYLL'LY (Gk. ἀν, an, neg. + ἴσος, isos, equal + φύλλον, phyllon, leaf). This is the phenomenon of the production on the same shoot of two sorts of leaves, large and small. It is well illustrated by several species of *Selaginella*, which possesses four vertical rows of leaves, two large and two very much smaller. In this plant the cause of the unequal size of the leaves is not known, but in other cases it has been shown to be due to the unequal action of various factors, the most important of which are light and gravity. The influence of the latter is shown in the development of anisophyllous rosettes upon the oblique stems of *Sempervivum*, while vertical stems of the same plant produce symmetrical rosettes, since all sides of the stem are equally exposed to the action of gravity. Consult Figdor, W., *Die*

Erscheinung der Anisophillie (1909), Boshart, K., *Beiträge zur Kenntnis der Blattasymmetrie und Exotrophie*, and *Flora* 103: 91-124 (1911). See LEAF.

ANJER, än'yër, or **ANJIER**, än'yër. A fortified seaport of Java, on the Straits of Sunda, 60 miles west of Batavia (Map: East India Islands, C 6). It is the landing place for passengers and mails for Batavia and is frequented by steamers for a supply of fresh water and food. In 1883 it was completely destroyed by a wave caused by the volcanic destruction of the neighboring island of Krakatoa, but it has been rebuilt since. Its population is estimated at 3000.

ANJOU, *Eng.* än'joo; *Fr.* än'zhoo' (from *Andecavi*, *Andegavi*, a Gallic tribe). A former province of France, now forming the department of Maine-et-Loire, and small parts of the departments of Indre-et-Loire, Mayenne, and Sarthe. It was inhabited in ancient times by the Andecavi, whose ancient capital bears the modern name of Angers. Under Fulk III Nerra (987-1040) the county of Anjou became very powerful; through his victories and those of his son Geoffrey Martel (1040-60), the counties of Touraine and Maine became subject to Anjou, and the Count of Blois was humbled. From this time amid the alternating fortunes of war Anjou remained one of the great powers in France. The most celebrated of the counts of Anjou was Geoffrey IV (1129-51), called Plantagenet, whose son by Matilda, daughter of Henry I of England, ascended the English throne in 1154 as Henry II. Anjou remained in the possession of the English kings till 1203, when it was seized by Philip Augustus. Some 40 years later it was bestowed as a fief upon Charles, the son of Louis VIII, who became by conquest in 1266 the founder of the Angevin line of kings in Naples and Sicily. At this time for nearly half a century it was united with Provence. From 1328 to the year 1360, in which it was made a duchy, it was held by the French crown as a part of the dowry brought by Margaret of Anjou to Charles of Valois, father of Philip VI. It was reunited with Provence under the rule of the kings of Naples in 1382. In 1480, upon the death of René the Good, it was annexed to the royal dominions by Louis XI. The last who bore the title of Duke of Anjou was the grandson of Louis XIV, who became Philip V of Spain. Consult Marchegay and Salmon, *Chroniques des comtes d'Anjou* (Paris, 1856-71).

AN-JU, än'joo'. A town of northwest Korea, 18 miles from the Gulf of Korea and 160 miles northwest of Seoul (Map: Korea, G 4). It became important during the Russo-Japanese War because of its nearness to the scene of operations.

ANKARSTRÖM, än'kär-strēm, JOHAN JAKOB. See ANCKARSTRÖM.

AN'KERITE. A carbonate of calcium, magnesium, and iron isomorphous with dolomite and siderite (q.v.) and intermediate between them in composition. It crystallizes in brownish to grayish rhombohedra closely resembling those of dolomite. It occurs chiefly in deposits of iron ore and is found in the hematite mines of Antwerp, N. Y., near Londonderry, Nova Scotia, and in the Styrian and German iron mines. It is named after Professor Anker of Styria.

ANKLAM, än'klām. A town of Prussia in the province of Pomerania, 44 miles northwest of Stettin, on the right bank of the Peene, and

4 miles from its mouth in the Kleine Haff (Map: Prussia, E 2). The river is navigable to Anklam, which has long been commercially important. Many of its private houses are excellent samples of German mediæval architecture. It manufactures linens and woollens and sugar, and has breweries, soap works, tanneries, and ship yards. There is considerable trade in the products of its home industries. Anklam was settled by Germans in the twelfth century and joined the Hanseatic League in 1244. During the wars of the seventeenth and eighteenth centuries it was repeatedly sacked. In 1720 it was acquired by Prussia. Pop., 1890, 13,000; 1900, 14,600; 1905, 15,604; 1910, 15,282.

ANKOBAR, än-kō'bēr, or **ANKOBER**. A town in eastern Africa, the former capital of the Abyssinian kingdom of Shoa, situated at an altitude of over 8000 feet, in lat. 90° 34' N. and long. 39° 53' E. (Map: Africa, H 4). The climate is healthful. Its population is estimated at 2000.

ANKO'RI or **ANKO'LE**. A plateau of the Uganda Protectorate, British East Africa, lying between lakes Albert Edward and Victoria.

ANKYLOSIS, än'kī-lō'sīs (Gk. ἀγκύλωσις, *ankylōsis*, a stiffening of the joints, from ἀγκύλη, *ankylē*, the bend of an arm, a joint bent and stiffened by disease). A term used in surgery to denote joint fixation not dependent upon muscular rigidity. It results from injury or disease, causing the formation of fibrous adhesions or the deposit of new bone between the articular surfaces. Osseous union may render the joint perfectly rigid, while fibrous union permits a certain amount of motion. In surgery fibrous is also known as *false*, and bony as *true* ankylosis. The elbow is especially apt to become ankylosed. In the knee or hip-joints osseous ankylosis is the preferable form, as the limb can then afford a rigid support. Joints stiff through a membranous ankylosis may be forcibly bent, and the bond of union ruptured, so as to restore mobility or allow of their being placed in a convenient position. Ankylosis of the joints between the ribs and the vertebræ is common in advanced age; and there are some cases on record of universal ankylosis of all the joints. Ankylosis is caused by injury, tuberculosis, gout, rheumatism, and syphilis. Passive motion, friction, massage, douches, and forcible motion under an anæsthetic are methods of treatment.

ANKYLOSTOMIASIS, än'kī-lō-stō-mī'ā-sīs (Gk. ἀγκύλος, hooked, and στόμα, mouth) or "Miners' Anæmia," is caused by the presence of an intestinal nematoid worm, the *Ankylostoma duodenale*, which acts like a bloodsucker. The disease was discovered by Dubini in 1838 and has been variously named brickmakers' anæmia, tunnel anæmia, Egyptian chlorosis, and Dochmiasis, the latter from the genus *Dochmius*, to which *A. duodenale* belongs. The worm is from 1-60 to 1-25 inch long and nearly cylindrical. Its head is provided with sucking discs and hooklets. The symptoms are those of simple anæmia, with or without bloody diarrhœa. It attacks principally miners. The disease was epidemic among coal-miners in Belgium in 1894, having been brought there by Italian laborers from the St. Gotthard tunnel. Access to the body is gained through the medium of food or soiled hands. Treatment consists of killing the parasites with anthelmintics after emptying the bowels with cathartics, and then relieving the anæmia with

arsenic, iron, or other tonics. As a prophylactic measure, all defecations should be disinfected and strict cleanliness be practiced. See **HOOKWORM DISEASE**.

AN'NA. A city in Union Co., Ill., 36 miles northwest of Cairo, on the Illinois Central Railroad (Map: Illinois, C 6). It is an almost purely agricultural community, producing wheat, corn, hay, fruit, and vegetables. Anna is the seat of the State hospital for the insane, and has a public library. The city owns its water works. Pop., 1890, 2295; 1910, 2809.

ANNA (Hind. *ānā*). An East Indian coin, a sixteenth of a *rupee* (about 33 cents), or about two cents of United States money. The anna is money of account only, though half and quarter annas are coined.

ANNA, SAINT, or ANNE. According to tradition, the wife of St. Joachim. After 21 years of barrenness, she is said to have given birth to the Virgin Mary, the mother of the Saviour. Nothing positive is known about her life; her name does not occur in the Scriptures. The first source for the tradition is the *Proto-evangelium* of James. Her cult can be traced to the fourth century, but toward the eighth she was widely invoked. Her body was believed to have been transferred from Palestine to Constantinople in 710 A.D. Düren, in the Prussian Rhine Province, Ursitz, in the diocese of Würzburg, and other churches claim to possess remains. The Roman Catholic church has a festival in her honor on July 26, established in 1584; the Greek, on December 9. In Austria, Bavaria, and other Catholic countries, this festival is one of great importance. The Fraternity of St. Anna was instituted in the thirteenth century. After the Reformation it was organized anew by the Jesuits and in modern times has manifested some vitality in Bavaria and Catholic Switzerland. She is the patron saint of child-bearers and miners, and it was upon her that Luther called for protection when in the storm, and to her he vowed to become a monk if rescued (1505). The shrine of St. Anne de Beaupré near Quebec is the most famous centre of her cult in America.

ANNABERG, än'nä-bërk. A town of the kingdom of Saxony, in the district of Zwickau, on the right bank of the Selma, 18 miles south of Chemnitz (Map: Germany, E 3), situated 1970 feet above the level of the sea. Originally Annaberg was a mining town and gained her importance in that industry. Barbara Uttmann, in whose honor a statue has since been erected, introduced lace-making in 1550, and since then the town has been chiefly occupied in the manufacture of lace and ribbon, much of which is exported to the United States. Pop., 1890, about 15,000; 1905, 16,813; 1910, 17,025.

AN'NABERGITE. A hydrous nickel arsenate which frequently accompanies nickel and cobalt deposits. It occurs in bright, apple-green fibres and earthy crusts.

ANNA COMNE'NA (1083-1148?). Author of one of the most valuable works in the collection of the Byzantine Historians. She was the daughter of the Emperor Alexius I (Comnenus) and was born on Dec. 1, 1083. She received the best education that Constantinople could give and was betrothed to the son of Michael VII. After the death of her fiancé she married Niephorus Briennius. During the last illness of her father she entered into a scheme to induce him to disinherit his eldest surviving son, John, and to be-

stow the diadem on her husband. After her father's death she plotted against her brother, and as a punishment, Anna, with her mother, was shut up in a convent, where she remained until the death of her brother in 1143. The date of her death is unknown, but she was still at work on her history in 1148. She entitled this work the *Alexiad*. The first two books treat of the history of the Empire from the time of Isaac Comnenus; the remaining 13 books are devoted to the reign of Alexius. Chronologically Anna is frequently at fault, and she omits purposely many events; but as a whole her work is useful. The best editions are those of Schopen and Reifferscheid (2 vols., Bonn, 1839-78), and of Reifferscheid (Leipzig, 1884). Consult: Chalandon, *Règne d'Alexis I* (Paris, 1900); Oster, *Anna Komnena* (Rastatt, 1868-71); and Diehl, *Figures byzantines* (Paris, 1909).

ANNA IVANOVNA, än'nä ê-vi'növ-nä (1693-1740). Empress of Russia. She was the second daughter of Ivan, the elder brother of Peter the Great. She was married in 1710 to the Duke of Courland, the last of his race, who died in the following year. The throne of Russia was offered to her by the Supreme Council on the death of Peter II in 1730, on conditions which greatly limited the power of the monarchy, terms which she soon broke. Her elevation was greatly due to the intrigues of the Chancellor, Ostermann, who had had the charge of her education, but who was disappointed in finding her not so grateful and tractable as he had expected. For some years, however, her rule was tolerable. Abroad, Russia took part in the War of the Polish Succession and waged a successful contest against Turkey in the Crimean War (1736-39). Internally the army was reformed, greater liberty was allowed to the landed gentry, and government debts were paid, though to pay them the peasants were crushed down with taxes. The administration of the Empress was a cruel one, due in a large measure to the influence which her paramour Biron exerted over her. Twenty thousand souls, it is said, were banished to Siberia; numbers were knouted, had their tongues cut out, or were broken alive on the wheel. Eleven thousand perished in this way. Prince Basil Dolgoruki and others of his family suffered the ignominy of the scaffold. At length the health of the Empress gave way. She died on Oct. 28, 1740, and left the throne to her grand-nephew Ivan, with Biron as regent. See **RUSSIA**; **BIRON**.

ANNA KARÉNINA, än'nä ká-rā'nyē-nā. One of Count Tolstoy's novels, which first appeared serially in a Moscow publication, from 1875 to 1878. It is a powerful study of the effects of passion upon human life and is by many considered the author's greatest work.

ANNA KARLOVNA, än'nä kár'löv-nā, or frequently, **ANNA LEOPOLDOVNA** (1718-46). Regent of Russia during the minority of her son Ivan. She was the daughter of Charles Leopold, Duke of Mecklenburg, and of Catharine, sister of the Russian Empress, Anna Ivanovna (q.v.). In 1739 she married Anthony Ulric, Duke of Brunswick-Wolfenbüttel. Her son, Ivan, born Aug. 24, 1740, was appointed by the Empress Anna Ivanovna as her successor. The Empress died in October, 1740, and Biron, whom she had made regent, was overthrown within a month. Anna Karlovna now proclaimed herself Grand Duchess and Regent of Russia; but she showed no capacity for managing the affairs of a great country, spent her time in indolent enjoyments,

and resigned herself very much to the guidance of one of the ladies of her court, Julia Mengden. A conspiracy was formed by a party desirous of raising to the throne Elizabeth, daughter of Peter the Great and Catharine, and this was accomplished on Dec. 6, 1741. The infant Ivan was sent to the castle of Schlüsselburg, where he was afterward murdered; Anna and her husband were condemned to prison for life and conveyed to Kholmogory, on the White Sea, where she died in childbirth. Her husband remained a prisoner for 39 years and died in 1780.

ANNALES, or **ANNALES MAXIMI**. See **ANNALS**.

ANNALISTS. See **ANNALS**.

ANNALS (Lat. *annales*, from *annus*, year). In the original sense, records of public events arranged year by year. In the early days of Rome such records were kept by the priests and were known as the *annales pontificum*, or *annales maximi*, because prepared by the *pontifex maximus*. In later times public men interested in history wrote crude chronicles of events, also known as *annales*, 'Year Books,' because they gave events year by year, with no attempt to trace the sequence of cause and effect; such annalists were Fabius Pictor, Cincius Alimentus, M. Porcius Cato (q.v.), L. Calpurnius Piso, Cælius Antipater, Valerius Antias, Claudius Quadrigarius, and many others. The annalistic method of writing appears even in the great work of Livy (q.v.). For Cicero's judgment of the *Annales* and of the Annalists see *De Oratore*, ii, 51-52, *De Legibus*, i, 6; see also W. W. Capes's edition of Livy, xxi, xxii, pp. xxxvii-xlii (London, 1883). When Ennius (q.v.), the "father of Roman poetry," wrote the deeds of Rome in heroic verse, he called his poem *Annales*; and finally Tacitus (q.v.) thus designated his story of Rome from Tiberius to Nero. See **ACTA**; **ACTA DIURNA**.

ANNALS OF A QUI'ET NEIGH'BORHOOD. The title of a novel by George MacDonald (1866).

ANNALS OF A SPORTS'MAN. A series of 22 short sketches (some of them not more than six pages in length) by Ivan Turgeneff. It was published in book form in 1852, and not only established the author's reputation but helped to bring about the liberation of the serfs under Alexander II. The stories are of the Russian peasant, for the most part, with now and then a sketch of the overseer, the district doctor, or the landed proprietor.

ANNALS OF THE PAR'ISH. The title of a novel by the Scottish writer John Galt (1821).

ANNALS OF THE POOR. A collection of stories containing *The Dairyman's Daughter*, *The Negro Servant*, etc., written by the Rev. Legh Richmond in the Isle of Wight and published in 1814.

ANNAM, ăn-năm' (*Nhan-nam*, Peace of the South), sometimes spelled **ANAM**. The central division of French Indo-China and formerly the designation of an independent empire which included the provinces of Annam, Tongking, and Cochin China (Map: French Indo-China). It embraces the greater part of the east coast of Indo-China (washed by the South China Sea), and stretches from Cochin China on the south to Tongking on the north, its southernmost point being about lat. 10° 30' N. and its northern extremity about lat. 20° 30', at the delta of the Song-koi, or Red River. On the west it is bounded by the country of the Laos, Siam, and

Cambodia. The area is about 52,110 square miles. The coast, about 750 miles long, is deeply indented and fringed with many islets.

Annam is traversed throughout its entire length from north to south by a mountain chain which slopes precipitously toward the sea, but declines gently toward the Mekong valley in the interior. It reaches in the peak of Pu-san an elevation of about 9000 feet. Pu-atuat is about 1000 feet lower. The country has two hydrographic zones. On the west is the basin of the Mekong; on the east are numerous coast rivers, shallow and nearly impracticable for navigation. The Mekong River rises in Tibet, flows through the extreme south of China, traverses the Indo-Chinese peninsula with a rapid current, gathering many tributaries on its way and forms the boundary between Annam and Siam. It is navigated by steamboats along the Annam frontier. The capital of Annam is Hué (population estimated at 61,600). The products of Annam include rice and other cereals, cinnamon, sugar-cane, coffee, tobacco, tea, and cotton. A considerable quantity of silk is produced, and the forests yield valuable woods. The buffalo is domesticated and used in tillage. The Chinese hog is reared in large numbers. The large game characteristic of the wilds of India abounds in Annam. One of the results following on French occupation of the Laos country was the diversion of trade from Bangkok in Siam to the Mekong valley and the sea-coast. The first commercial caravan coming from Laos arrived at Hué in February, 1895. The principal imports are cotton goods, Chinese paper, machinery, metals, Chinese drugs, flour, petroleum, and tea. The exports consist of sugar, cinnamon, horn, ivory, skins, raw silk, tea, wood, etc. In 1897 the imports amounted to 4,719,349 francs and the exports to 2,552,919 francs. The principal ports of Annam are Tourane and Qui-nhon.

The government is in theory a monarchy. The king is assisted by a council of six members, though everything is in reality subject to the French resident superior at Hué, who has a staff of assistants and a military guard. The country is divided into 12 provinces, each of which is subdivided into *fu* ('departments') and *huje* ('districts'). Most of the actual administration of justice and tax collection is under the native officials. Service in the native army, of 10,000 men, who are under French officers, is compulsory. The population of Annam was estimated in 1911 at 5,542,822.

The Annamese comprise at least two different stocks—the rather primitive Mois of the mountainous interior, and the Annamese proper, both of whom exhibit quite uniform physical types, notwithstanding intermixture with other peoples (Khmers, Malays, Chinese, etc.) in prehistoric and in recent times. The foreign-born population, living chiefly in the towns, comprises about 4000 Chinese and 2000 Europeans. In appearance the Annamese proper are the least attractive of the Indo-Chinese races. They are short, rather slenderly built, and brachycephalic. They have a swaggering stride or gait, arising from a peculiar structure of the pelvis and femur and a notable separation of the big toe, or "foot-thumb," from the other toes. In race they are Mongolian. This speech is monosyllabic, belonging to the Mon-Khmer branch of Indo-Chinese languages. Like most of the peoples of this region, they possess strains of Aryan,

and, possibly, negroid blood. Annamese culture and folk-lore are largely reflections of Chinese. From China came also the written characters of their language, their literature, and the form of Buddhism and Confucianism professed by the more enlightened classes. The Annamese are essentially democratic in disposition and live in patriarchal style, the father having almost absolute authority in his family. About 420,000 of the inhabitants are Catholics. Among the principal towns are Hué, the capital, Bindinh (pop., 75,000), Than-hoa, and Tourane (pop., 6800).

Subjected to China, together with Tongking, in the third century B.C. by She Twang Ti, Annam became autonomous under Chinese suzerainty in 1428 A.D. after long and sanguinary wars. In 1789 the ruler of Annam was able, with French aid, to free himself from subjection to China and to join Tongking and Cochin China to his empire. This became a field of French influence. Under Napoleon III France began the establishment of her dominion in Indo-China by engaging in hostilities with Annam in 1858. In 1862 the King was compelled to cede the principal part of Cochin China to the French, and the rest of that territory was added in 1867. The French continued to encroach, entered in 1882 upon the conquest of Tongking (of which they became masters in 1885), and the treaty of June 6, 1884, ratified at Hué, Feb. 23, 1886, established a French protectorate over Annam. French troops occupy the citadel at Hué, and France controls the finances. Prince Bun-Lan, who was proclaimed King in 1889, under the name of Than-Thaï, attained his majority in 1897. On account of his vices and cruelties he was forced by the French to abdicate, Sept. 9, 1907, in favor of his son Duy-Tan (born 1899), who was placed under a council of regency.

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AN'NA MATIL'DA. A pseudonym under which Hannah Parkhouse Cowley maintained a poetical correspondence with Robert Merry ("Della Crusca"), the leader of the so-called English "Della Cruscans," in the *World*, ending about 1789, when the correspondents first met personally. Their interchange of verses gained an added notoriety from Gifford's satire *Baviad* and *Mæviad*, which held it up to ridicule. "Anna Matilda" has come to be used typically of a writer of tasteless sentimentalism.

AN'NAN. A seaport and parliamentary burgh in the county of Dumfries, Scotland, on the river of the same name, near its entrance into the Solway Firth, and 15 miles by rail from the city of Dumfries (Map: Scotland, E 5). It is neat and well built. Among its industries are shipbuilding, tanning, cotton-spinning, and rope-weaving. Sandstone, of which many of its buildings are constructed, is quarried near by. The river is navigable for large vessels half a mile below the town. There is regular communication by steamers with Liverpool and Whitehaven, and railways connect the town with Edinburgh, Glasgow, and Carlisle.

The burgh unites with Dumfries, etc., in returning one member to Parliament. Pop., royal parliamentary and municipal burgh, 1901, 7073; 1911, 6892.

AN'NANDALE. The valley of the river Annan, in Dumfriesshire, Scotland.

ANNANDALE, CHARLES (1843-1915). An English author. He was born in Kincardineshire, and was educated at Aberdeen University. He edited such important works of reference as the *Imperial Dictionary* (1882); *Blackie's Modern Cyclopædia* (1890; new ed., 1907); *Student's Dictionary* (1895); *New Cabinet Encyclopedia and Treasury of Knowledge* (1895); *New and Universal Self-Pronouncing Encyclopedia*.

ANNANDALE, THOMAS (1838-1907). An English surgeon. He was born at Newcastle and was educated at Edinburgh University, where he subsequently was appointed assistant to Professor Syme. He was for some time demonstrator of anatomy under Professor Goodsir at the same university and in 1877 was made regius professor of clinical surgery there. He published *Diseases and Injuries of Fingers and Toes* (1865), *Abstracts of Surgical Principles* (1868-70), and other important works.

ANNAP'OLIS. The capital of Maryland and the county-seat of Anne Arundel County, on the Severn River, 2 miles from Chesapeake Bay, 26 miles by rail southeast of Baltimore, and 30 miles (direct) northeast of Washington, D. C. It is on the Maryland and the Annapolis, Washington, and Baltimore electric railroads, and has boat service to Baltimore and other cities on the bay (Map: Maryland, M 5). The city's most noteworthy feature is the United States Naval Academy (q.v.), with its beautiful buildings and grounds. Other points of interest are the marine barracks and naval experiment station, St. John's College, founded in 1789, the State government buildings, and the statues of Chief Justice Taney and General De Kalb. The city has a fine harbor and is the seat of an extensive oyster-canning industry, the product being largely exported. Pop., 1890, 7604; 1900, 8525; 1910, 8609.

In 1608 Capt. John Smith visited the site of Annapolis, but no settlement was made until 1649, when a company of Puritans from Virginia established here the town of "Providence," which name was later changed successively to "Proctor's," "The Town," "Anne-Arundel Town," and, finally, to the "Town of Annapolis," in honor of Queen Anne. In 1694 the capital of the province was moved here from St. Mary's, and Annapolis was made a city in 1708 by a charter from Queen Anne. Early in the eighteenth century one of the first free schools on the continent was established here. From this St. John's College (q.v.) developed. On May 25, 1774, the citizens passed resolutions of sympathy for Boston, whose port had just been closed, and on October 18 the brig *Peggy Stewart*, laden with tea, was publicly burned. On Dec. 23, 1783, Washington surrendered his commission as Commander-in-Chief of the Continental Army to Congress, then sitting at Annapolis. Consult Ridgely, *Annals of Annapolis* (Baltimore, 1841), Riley's "Ancient City," and a sketch in Powell's *Historic Towns of the Southern States* (New York, 1900).

ANNAPOLIS CONVENTION, THE. A convention held at Annapolis, Md., Sept. 11, 1786, to consider the question of intercolonial commerce and discuss some proposed alterations in

the Articles of Confederation. Commissioners from only five States, Virginia, Delaware, Pennsylvania, New Jersey, and New York, were present (though New Hampshire, Massachusetts, Rhode Island, and North Carolina had appointed delegates, who did not attend); and the Convention accordingly adjourned after recommending that a convention of all the States be called for the purpose of rendering the "Constitution of the Federal Government adequate to the exigencies of the Union." This led to the Constitutional Convention of 1787. Proceedings may be found in *United States Bureau of Rolls*, vol. i.

ANNAPOLIS ROYAL. Originally the Port Royal of the French occupation. A port of entry and summer resort in Nova Scotia, Canada, 130 miles west of Halifax, on the Dominion Atlantic Railroad, and at the mouth of the Annapolis River, an inlet of the Bay of Fundy (Map: Nova Scotia, D 5). It has an excellent harbor, which is accessible to ocean steamers, and exports lumber and apples, the latter especially, since it is the chief product of the entire district. The United States is represented by a consular agent. Annapolis Royal is the oldest European settlement in British North America. It was the scene of many conflicts between the French and English and was ceded by the former in 1713, when its name was changed in honor of Queen Anne. Old Fort Anne has been restored by the Dominion government and the citizens of the town, and within the fortifications a monument has been erected to the memory of De Monts, who landed here in 1604. Pop., 1901, 1019; 1911, 1019.

ANN ARBOR. A city and the county-seat of Washtenaw Co., Mich., 37 miles (direct) west of Detroit, on the Michigan Central, and the Ann Arbor and Toledo railroads, and the Huron River (Map: Michigan, F 6). It is the seat of the University of Michigan, and has a fine high school, two schools of music, two libraries, a court house, five hospitals, and a large auditorium. Ann Arbor is the centre of a fertile agricultural district and has important manufactures of pianos, flour, automobile accessories, laces and curtains, and steel ball-bearings. Water power producing a supply of electricity sufficient for an area of 60 square miles is obtained from the Barton Dam. Ann Arbor was settled in 1824 and was incorporated as a city in 1851. Pop., 1890, 9431; 1900, 14,509; 1910, 14,817.

ANNARR', or **ONARR'**. In Norse mythology, the husband of Nött (night), and father of Jörd (the earth).

AN'NAS (Heb. merciful). A Jewish high priest, appointed by Quirinius in 6 A.D. and deposed by Valerius Gratus in 15 A.D. He, no doubt, continued to exercise great influence, as the office was held by five of his sons, Eleazar, Jonathan, Theophilus, Ananos, and Matthias, and by his son-in-law, Joseph, surnamed Caiaphas, between 18 A.D. and 36 A.D. The wealth of "the house of Annas" was to some extent derived from the booths, where they provided all kinds of materials for sacrifice. By this monopoly they made the temple "a den of robbers" and drew down upon themselves the curses of the Pharisees as well as the indignation of Jesus. The influential position of Annas may have led to the erroneous statement of Luke, that there were two high priests, Annas and Caiaphas (iii. 2), and the consequent Johannine account of a separate trial of Jesus, before Annas (xviii. 13-

27). A son of Annas, by the same name, was appointed high priest by Agrippa II in 62 A.D. He is said to have put to death James, the brother of Jesus; but the passage of Josephus (*Ant.* xx, 9) which relates this is supposed by many scholars to be a Christian interpolation. Consult Schürer, *Geschichte des jüdischen Volkes*, pp. 270 ff. (4th ed., 1907).

ANNATES, än'näts, or **FIRST FRUITS**. In ecclesiastical law, the value of every spiritual living for a whole year (hence the name, from the Lat. *annus*, a year), which the Pope, claiming the disposition of every spiritual benefice within Christendom, reserved out of every living. This impost was at first levied only from persons appointed to bishoprics; but it was afterward extended to the inferior clergy. The value of these annates was calculated according to a rate made under the direction of Pope Innocent IV (1253 A.D.), but afterward increased by Pope Nicholas III (1292 A.D.). The valuation of Pope Nicholas is still preserved in the exchequer. This papal exaction was abolished in England by the Act 25 Henry VIII, c. 20, and by an act passed in the following year of the same reign (26 Henry VIII, c. 3), the right to annates, or first fruits, was annexed to the crown. The various statutes subsequently passed on this subject have all been consolidated by an act (1 Vict., c. 20) regulating the collection of the moneys so levied. See **FIRST FRUITS**; **QUEEN ANNE'S BOUNTY**.

ANNATTO, än-nät'tô. See **ARNOTTO**.

ANNE (än) OF AUSTRIA (1601-66). The daughter of Philip III of Spain, who in 1615 became the wife of Louis XIII of France. The marriage was so far from being a happy one that the royal pair lived for 23 years in a state of virtual separation—a result due chiefly to the influence of Cardinal Richelieu, whose fixed determination to humble the house of Austria led him to spare no means for alienating the affection of Louis by representing her as ever involved in conspiracies against his authority. Her imprudence, however, lent much force to Richelieu's accusations, for she certainly was concerned to some degree in the conspiracies of Chalais (1628) and Cinq Mars (1642). On the death of the King, in 1643, Anne became Queen Regent for her son Louis XIV, and evinced her discernment by choosing as her minister Cardinal Mazarin, whom she is said to have married secretly, and by whose able management the young King (Louis XIV) came into possession of a throne firmly established on the ruins of contending parties. (See **FRONDE**.) Her character was marked by contradictions. Her stately coldness, which failed to attract her husband, often gave way to fits of reckless gayety which repelled him. Without being actually treasonable, she often engaged in intrigue. Proud of her royal state, she made an Italian *parvenu* her favorite and, as some say, her husband. There was in her a great conflict between the woman and the queen. Consult: Freer, *Married Life of Anne of Austria* (London, 1895, later ed., 1913); *Regency of Anne of Austria* (London, 1866); Matcville, *Memoirs of Anne of Austria and her Court* (New York, 1901).

ANNE OF BRITTANY (1476-1514). Queen of France. She was the daughter and heiress of Francis II, Duke of Brittany. By her marriage to Charles VIII, Dec. 6, 1491, Brittany became incorporated with France. Anne had been affianced to Maximilian of Austria, but the

French King took care not to let slip so rich a prize. During Charles VIII's campaigns in Italy she governed France well. After her husband's death she married his successor, Louis XII, over whom she had great influence. She was a woman of beauty and intelligence.

ANNE OF CLEVES, klēvz (1517-57). The daughter of John, Duke of Cleves, and fourth queen of Henry VIII of England, who reluctantly married her on Jan. 6, 1540, to conciliate the German Protestant princes, but divorced her on July 9 of the same year on the ostensible ground that he had never really given his inward consent to the marriage. Anne was a very homely woman. She died at Chelsea, July 16, 1557. Consult the *Gentleman's Magazine*, vol. ccxc (London, 1901), and Hume, *The Wives of Henry VIII* (London and New York, 1905).

ANNE OF DENMARK (1574-1619). The wife of James I of England (q.v.), born at Skanderborg, Jutland. Negotiations for her marriage to the young Scottish King were begun when she was only 11 years old, but because of the opposition of Queen Elizabeth the ceremony was delayed until after the execution of James's mother, Mary Stuart, Queen of Scots. The Scottish nobility then demanded that the royal match be concluded at once, but two years passed before Anne was married, in August, 1589, by proxy, and on November 23, in person, to James. Six months after the wedding at Opslo, Norway, the couple arrived in Scotland. Anne was crowned with James at Westminster (1603), when he ascended the English throne, and shortly afterward took up her residence in London. Exceedingly fond of display, she found that the active promotion of court entertainments, such as masks, and the furthering of "progresses" through the country, afforded her the best of opportunities for outshining the ladies of her court. She took part in numerous plays, including Ben Jonson's *Mask of Blackness* and *Mask of Queens*, and is reported to have danced in Shakespeare's *Twelfth Night* when she was 43 years old. Anne's "progress" to Bath in 1613 cost £30,000. Accustomed not only to lavish personal display, but to the satisfaction of an expensive taste in things artistic, her demands for funds outstripped a generous Parliament's grants. At the time of her death she had incurred such heavy debts that it was found impossible to get credit for the funeral expenses, and lack of ready money forced a delay. While Anne had inclined toward Catholicism at one time in her life, before its close she professed the Protestant faith. Consult A. Strickland, *Queens of England*, vol. vii (1844).

ANNE OF GEIERSTEIN, gī'ēr-stīn. The title of a novel by Scott (1829), based upon events connected with the victory of the Swiss over Charles the Bold of Burgundy in the fifteenth century.

ANNE, ān, **QUEEN OF GREAT BRITAIN AND IRELAND** (1665-1714). The last British sovereign of the house of Stuart. She was born at St. James's Palace, London, Feb. 6, 1665, and was the second daughter of the Duke of York, afterward James II, by his first wife, Anne Hyde, the daughter of the Earl of Clarendon. When she was about seven years of age, her mother died, and her father soon after professed himself a member of the Church of Rome; but he permitted his daughters to be educated in the principles of the Church of England, for which Anne always retained an ardent if not a very

enlightened attachment. To advance his own popularity, her father gave her in marriage, in 1683, to Prince George of Denmark, brother of Christian V, an indolent and good-natured man, who concerned himself little about public affairs and was endowed with no capacity for taking part in them. Anne's own weakness of character and that of her husband gave opportunity to Lady Churchill, afterward Duchess of Marlborough, her early playfellow, to acquire an influence over her which during many years was almost supreme. During the reign of her father Anne lived in retirement, taking no part in politics. On the landing of the Prince of Orange she seems at first to have hesitated, and even to have been inclined to adhere to the cause of her father, whose favorite daughter she was; but Churchill had made up his mind to an opposite course, and his wife induced the Princess to adopt it. She consented to the act by which the throne was secured to the Prince of Orange in the event of his surviving her sister Mary; but quarreled with the King and Queen over money matters. Although she had borne 17 children, only one, the Duke of Gloucester, survived infancy, to die in 1700, in his eleventh year; and Anne was without a direct heir when she ascended the throne on March 19, 1702. The influence of Marlborough and his wife was powerfully felt in all public affairs during the greater part of her reign. The strife of parties was violent, and political complications were increased by the Queen's anxiety to secure the succession to her brother. In so far as she had any political principles, they were opposed to that constitutional liberty of which her own occupancy of the throne was a sort of symbol, and were favorable to absolute government and the assertion of royal prerogative according to the traditions of her family. These principles, and her family attachment, tended to alienate her from the Marlboroughs, whose policy, from the time of her accession, had become adverse to Jacobitism, and who now, along with Godolphin, were at the head of the Whig party. The Duchess also offended the Queen by presuming too boldly and haughtily upon the power which she had so long possessed.

Anne found a new favorite in Mrs. Masham, a relative of the Duchess, who had introduced her into the royal household. To Mrs. Masham's influence the change of government in 1710 was in a great measure owing, when the Whigs were cast out, and the Tories came into office, Harley (afterward Earl of Oxford) and St. John (Lord Bolingbroke) becoming the leaders of the ministry. But although they concurred more or less in the Queen's design to secure the succession of the throne to her brother, the new ministers had quarrels among themselves which prevented its successful prosecution; their plans and intrigues became sufficiently known to alarm the nation and to alienate many political supporters of the government party. A dispute between Oxford and Mrs. Masham, carried on for hours in the Queen's presence and terminating in her demand for his instant resignation, seems to have brought on the attack of apoplexy of which she died, Aug. 1, 1714. The Elector of Hanover succeeded her as George I. The principal event of her reign was the union of England and Scotland, in 1707, and she was the last sovereign who ruled over these as separate kingdoms, and the first sovereign styled "of Great Britain." Another important event was the War of the

Spanish Succession, in which the Duke of Marlborough won brilliant victories over the armies of Louis XIV of France. Queen Anne was of middle size and comely, though not beautiful. She was virtuous, conscientious, and affectionate, more worthy of esteem as a woman than of admiration as a queen. Her reign is often mentioned as a period rendered illustrious by some of the greatest names, both in literature and science, which her country has ever produced; but literature and science owed little to her active encouragement. Consult: Burton, *Reign of Queen Anne* (London, 1880); McCarthy, *The Reign of Queen Anne* (London, 1902); Paul, *Queen Anne* (London, 1907); Jonathan Swift, *Four Last Years of Queen Anne*.

ANNE, SISTER. In the story of *Bluebeard* (q.v.), the sister of Fatima. While Fatima is awaiting the penalty of her disobedience, Anne, on the top of the tower, watches for the coming of their brothers to save them.

ANNEAL'ING (from ME. *anelen*, OF. *neeler*, Fr. *nieller*, to enamel, from Lat. *nigellus*, blackish). The process by which glass and certain metals are heated and then slowly cooled to make them more tenacious and less brittle. The rationale of annealing has been most studied, perhaps, in connection with steel manufacturing. Important steel castings are nearly always annealed, and it is a common requirement for steel forgings. In the working of metals, such as the drawing of rods, wire, and pipe, the rolling of plates, or hammering, the metal becomes brittle, and frequent annealing is necessary. It is a common practice to anneal steel plates for the best marine boiler work. The hardening and tempering of steel are analogous processes to annealing, there being a close interrelation between the three phenomena. Steel is hardened by sudden cooling from a high temperature, usually at or above red heat, by plunging it into oil, water, etc. To temper steel means, in its specific sense, to mitigate, or to moderate, the effects of previous hardening. It is usually performed by gently reheating the previously hardened steel to a much lower temperature than red heat and then cooling it, generally suddenly, but sometimes slowly. While tempering somewhat moderates the effects of previous hardening, annealing aims nearly completely to eliminate them. Annealing of steel is usually effected by slow cooling from a temperature at or above red heat. Thus steel is in its hardest and most brittle state when hardened, in its softest and toughest when annealed, and in an intermediate condition when tempered.

In hardening, the steel articles, if small, are heated in boxes or pans filled with charcoal dust and placed in reverberatory furnaces. Larger articles are heated in the furnace proper, which is often made of a special shape to fit the form of the article, such, for instance, as a long gun tube. In general, the more rapid the cooling, the harder and more brittle is the steel. The surface of steel or iron, when heated in contact with charcoal, absorbs a certain percentage of carbon, resulting in a higher carbon steel which increases the hardness when the metal is rapidly cooled. By this method a hard surface backed by comparatively soft tenacious iron can be produced, such as armor plate and rock-crushing machines. Mercury is the most rapid cooling agent, and water, rapeseed oil, tallow, and coal-tar follow next in the order named. Steel castings and forgings for guns, marine engine-shafts,

and armor-plate, where strength is more important than hardness, are usually cooled in oil; while steel for cutting tools, where extreme hardness is the important thing, is ordinarily hardened in water.

In tempering hardened steel articles they are slowly heated by contact with hot iron bars, plates, or rings, on the surface of melted lead or other fusible metal, in hot sand, in burning charcoal, or in special furnaces, to a temperature of from 428° F. to 600° F. The temperature required for razors is from 446° F. to 469° F.; for shears and scissors, 491° F.; for woodworking tools, 531° F.; for swords and coiled springs, 550° F.; for handsaws, 600° F. The heated article is cooled by plunging it into a bath of water or oil.

In annealing, the article is heated uniformly in a furnace, without direct contact with the flames, to the temperature generally of bright cherry red. The common method of cooling is to withdraw the fire from the furnace and to close all apertures, allowing the furnace slowly to cool down. Cooling is sometimes accomplished by burying the heated article in ashes, lime, or other slow conductors of heat, and allowing it to become cool by the radiation of its heat. Boiler and ship plates are often cooled by simply withdrawing them from the furnace and throwing them on the mill floor to cool by radiation. When medals are repeatedly struck by the die-stamper, the gold or other metal, by the concussion, becomes brittle, and requires to be heated and annealed at intervals. Annealing is necessary in gold-beating and in rolling, hammering, and stamping sheet metals generally. Articles of tin, lead, and zinc, which are metals with a low melting temperature, are annealed in boiling water, which is allowed to cool with the article immersed. Malleable iron is cast-iron annealed by being covered with powdered hematite ore and heated and then slowly cooled.

In the making of glass vessels by the glass-blower (see GLASS), they are of course quickly reduced in temperature while the fused glass is being molded into the desired shape. The atoms of the glass thus rapidly compelled to assume a permanent position do not seem to be properly and firmly arranged together, and the vessel is very liable to be broken, either by a slight but smart blow, or a sudden increase or decrease in temperature. This brittleness is very observable in the *lacrimæ vitreae*, or glass tears, known as Prince Rupert's drops, obtained by allowing molten glass to fall into water, when the glass forms pear-shaped drops, which are so brittle that if they be scratched with a file or the end be broken off the whole bursts asunder and falls down into a fine powder of glass. The same brittleness is exhibited in Bologna jars, or vials, which are small and very thick, and yet, if a minute angular fragment of any hard substance be dropped into the jar, the latter flies to pieces.

In the annealing of glass vessels they are arranged in iron trays and placed in a long oven, where they are gradually raised in temperature to near their fusing point by the trays being drawn along to the hottest part of the oven; and thereafter the trays, with their contents, are very slowly drawn into a cooler and cooler part, till they become cold. The annealing operation generally takes 12 hours for small articles, such as wine glasses; but days, and even a week or two, are required completely to anneal large vessels. Many articles of glass, such as tubes for

steam gauges, lamp glasses, etc., are annealed by immersion in cold water, which is very gradually raised to its boiling point and then cooled.

The theory of annealing is one of considerable technical intricacy, and scientists are not altogether in agreement as regards many of its features. For the theory and practice of the hardening, tempering, and annealing of steel, consult Howe, *Metallurgy of Steel* (New York, 1892), and Woodworth, *Hardening, Tempering, Annealing and Forging of Steel* (New York, 1903).

ANNECY, ân'sè'. The chief town of the department of Haute-Savoie, France (Map: France, S., L 3), in the midst of a fertile country at the northwestern extremity of the Lake of Annecy and 22 miles south of Geneva. The Lake of Annecy is 1470 feet above the sea and is surrounded by magnificent mountain scenery. It is about 9 miles long and 2 miles wide, its waters flowing by the Fieran to the Rhone. Annecy has manufactures of linens, cotton yarn, felt hats, paper, straw goods, iron, and steel wares. Its linen bleachfields have existed since 1650. Near Annecy is a famous bell foundry. The town is clean and has an air of respectable antiquity, the shops in many of the streets being under arcades. The most remarkable buildings are the château, once the residence of the family of Genevois-Nemours, the old and new bishops' palaces, the cathedral, and the modern church of St. Francis, the latter of which boasts of possessing the relics of St. Francis of Sales and St. Jane Frances Chantal. Annecy has a scientific and archaeological museum. In the public gardens is a statue of Berthollet, a celebrated chemist who was born at Talloire, near by. Pop., 1901, 13,611; 1911, 15,622.

In the twelfth century Annecy was called *Anneciacum Novum*, to distinguish it from Old Annecy, *Anneciacum Vetus*, which occupied the slopes of a neighboring hill, and was a place of some consequence in the times of the Romans. In the earlier part of the Middle Ages Annecy belonged to the counts of Geneva, and on the extinction of that house it passed to the house of Savoy, in whose possession it remained, except for a brief period under the French Empire, until the transference of Savoy to France in 1860.

ANNEL'IDA. See ANNULATA.

ANNENKOFF, ä'nyën-kôf, MIKHAIL NIKOLAYEVITCH (1835-99). A Russian soldier and engineer, born in St. Petersburg. He was educated as a member of the corps of pages, took part in crushing the Polish insurrection of 1863, and was connected with the administration of affairs in Poland until 1866. He was promoted to be colonel, and during the Franco-Prussian War accompanied the German army. In 1867 he attracted considerable attention by his articles in the *Voyeni Sbornik* (a military journal) on utilizing the railroads in military activities. In the Russo-Turkish War of 1877-78 he directed the military transportation. He became a lieutenant-general in 1878 and served in the campaign against the Tekke-Turkomans in 1880-81. He directed the construction of the railway from the Caspian Sea to Samarkand (1881-89) and in 1892 began the construction of the line from Samarkand to Tashkent. He was also known as the chief promoter of the Trans-Siberian Railway. Besides the papers already mentioned, he published *Observations and Views of a Russian Officer* (1871) and *Siberia and its Railroads* (1888).

ANNENKOFF, NIKOLAI IVANOVITCH (1819-

89). A Russian botanist. He studied at Moscow and in 1853 became a director of the School of Agriculture. In 1863 he was appointed director of the School of Horticulture at Uman. His works include a dictionary of botany, in which the names of plants are given in Russian, French, German, English, and other languages.

AN'NEXA'TION (Lat. *annexus*, a tying or binding to, from *ad*, to + *nectere*, to tie). The acquisition by a state of territory previously independent or in the possession of another power. Though strictly applicable, perhaps, only to the extension of a state's sovereignty over adjoining territory (as in the annexation of Alsace-Lorraine to Germany as the result of the Franco-Prussian War, and of California and adjacent territory to the United States as the result of the war with Mexico), the term is applied to any territorial acquisition, near or remote, as in the cession of Porto Rico and the Philippines to the United States, and the forcible annexation of the Boer republics in South Africa to the British Empire. Mere cession of a territory does not nullify the existing laws until otherwise ordained, and, until possession is taken, the prior authorities retain their police functions, although, technically speaking, sovereignty ceases upon completion of cession. Thereupon the inhabitants of the annexed territory are absolved from their allegiance to their former sovereign and their legal relation to him is dissolved, but not their relations to each other. Titles to property are not affected by cession, excepting in the substitution of the new sovereign for the old as lord paramount. See TENURE.

As annexation is a legal fact, resulting in the virtual incorporation of foreign territory in the annexing state, it does not proceed from such extra-legal or informal acts as discovery, occupation, or military conquest, but requires for its completion the official and legal action of the state, by treaty duly made and ratified, by proclamation of the sovereign, or by legislative act. Thus, it was decided by the Supreme Court of the United States, in the so-called Insular cases (1901), that Porto Rico remained foreign territory, notwithstanding the destruction of the Spanish sovereignty and government and the occupation of the island by the military forces of the United States until the ratification of the treaty of peace with Spain in 1898, and that it was this act which extended the sovereignty of the United States over that island. Where the transfer of title is not acquiesced in by the former sovereign, there must be an effective occupation and a virtually complete destruction of the previously existing authority. But the annexation may be complete notwithstanding the active or passive opposition of the inhabitants of the territory affected, as in the case, previously referred to, of the Boers in South Africa and the native population in the Philippine Islands. Consult Randolph, *The Law and Policy of Annexation* (New York, 1901). See ALLEGIANCE; COLONY; CONQUEST, and the authorities there referred to.

AN'NIE LAU'RIE. A Scottish song of the eighteenth century, by William Douglas, of Scotland, to Annie, daughter of Sir Robert Laurie, of the Maxwellton family. It was set to music by Lady Jane Scott.

ANNI'HILA'TIONISM (from Lat. *ad*, to + *nihil*, nothing). The theory of the utter extinction of man's being, both bodily and spiritual.

either at death or at some later period. Christian theology was for ages dominated by the Greek theory of the natural immortality of the soul. Modern philosophy began to question this theory. Spinoza (*Tractatus de Deo et Homine*), Hobbes, and Locke argue for possible annihilation. In theology little was heard of the doctrine until the eighteenth century, when Taylor, of Norwich, England, McKnight, and a few others wrote upon it. Among later supporters perhaps Archbishop Whately may be counted; for in his *View of the Scripture Revelations Concerning a Future State*, he says that in the passages in which "death," "destruction," "eternal death," are spoken of, the words may be taken as signifying literal death, real destruction, the utter end of things; that "unquenchable fire" may mean a fire that quite consumes what it feeds upon, and the "worm that dieth not" may be that which entirely devours its prey. In the United States the question was revived by *Six Sermons on the Question: Are the Wicked Immortal?* by George Storrs (Philadelphia, 1848). James H. McCulloh in his *Analytical Investigations Concerning the Scriptures* (Baltimore, 1852), maintained that after the final decisions at the judgment the wicked will be utterly destroyed by the visitation of God in wrath. C. F. Hudson, in *Debt and Grace, as Related to the Doctrine of a Future State* (Boston, 1857), denies that the natural immortality of the soul is even implied in the Bible; on the contrary, life and immortality are brought to the redeemed alone, all others being not only naturally mortal, soul and body, at death, but after that mortal suspension of positive existence, all are raised at the final resurrection and cast into the lake of fire at the second death. He denies that endless conscious suffering is ever affirmed to be the nature of future penalty, but affirms that the penalty consists in privation, and that in the perpetuity of this privation consists the eternity of future punishment. R. W. Landis replied to Hudson, in his treatise *On the Immortality of the Soul and the Final Condition of the Wicked* (New York, 1859), and many other writers discussed the subject, especially in religious reviews and magazines.

The discussion then broadened out and was participated in by members of all communions. The general purpose was to gain some relief from the thought of the eternal suffering of vast multitudes of human souls. It has accordingly been argued that sin is corrupting in its nature, that it leads necessarily to degeneration and decay, and that a sinning soul, embarked upon a course of rebellion against God, must finally wear its life-forces out and cease to be. It is argued, on the other hand, that this position has no support in the Bible, and that there is no evidence, from the experience of sinners in this world, that sin, however much it may otherwise affect the nature, substantially diminishes the power of life. The tendency among thinkers who have sought relief in this direction has therefore been rather to the doctrine of "conditional immortality," so called, that the soul of man is not by nature immortal, but becomes so by the special gift of Christ upon the exercise of a genuine faith in him, and that apart from this faith man would eventually, and probably at death, cease to be. Against the objection that thus multitudes of souls would seem to have been created to no purpose, the analogies of evolution are brought by some, by which multitudes of forms are

everywhere produced that a few select ones may survive. The soul itself thus enters into the "struggle for existence," and the "fittest" souls survive; that is, those who have risen by Christian faith to the higher plane of life. The chief advocate of the view is Rev. Edward White, *Life in Christ* (London, 1846). A modification of this view is to be found in S. D. McConnell's *Evolution of Immortality* (New York, 1901).

AN'NISTON. A city and the county-seat of Calhoun Co., Ala., 63 miles east by north of Birmingham, on the Southern, and the Louisville and Nashville railroads (Map: Alabama, D 2). It has a fine location in the foothills of the Blue Ridge Mountains and contains a park, fair grounds, the beautiful churches of St. Michael and All Angels, the Alabama Presbyterian College for young men, the Noble Institute for young ladies, and the Barber Memorial Seminary, an industrial college for colored girls. The city is in a productive coal, iron, corn, grain, and cotton region and is the centre of an important cotton trade. Its chief industry, however, is the manufacture of cast-iron pipe. There are also extensive blast-furnace foundries and machine shops, rolling mills, freight-car, locomotive, and boiler works, cotton-goods manufactories, a carriage factory, and a yarn mill. Anniston was founded in 1873 by the Woodstock Iron Company, headed by Samuel Noble, but was not thrown open to the general public until 10 years later. In 1912 the National Guard of eight southern States held their field manœuvres here, under the direction of the United States War Department. Pop., 1890, 9998; 1900, 9695; 1910, 12,794.

ANNOBON, ä-n-ô-bôn'. An island in the Gulf of Guinea, about 1° 30' S. lat., belonging to Spain (Map: Africa, E 5). It has an area of a little over 6 square miles and is highly mountainous. The population in 1910 was 1313, mostly black, and some of them have been converted to Christianity. The island was discovered by the Portuguese in 1471 and ceded to Spain in 1778. The only town is San Antonio de Praga, in the northern part.

ANNONA. See CUSTARD-APPLE.

ANNONAY, ân'nô'nâ' (anciently Lat. *Annoneum*). A picturesque town of France, in the department of Ardèche, situated at an altitude of over 1000 feet, where the valley of the Déome joins the valley of the Cance, 37 miles south of Lyons (Map: France, S., J 3). It has a rugged beauty of its own, the houses and jutting rocks interspersed along steep and narrow streets. The principal buildings are the Gothic church, built in 1614, the college, the museum, and library. It carries on an active trade and industry, the chief articles of manufacture being paper, of which nearly half a million reams are produced annually, glove leather from kid skins, silk and cotton twist, woolen cloth, and flour. A great quantity of silk is produced in the neighboring villages. The paper mills of Annonay were established by the father of the celebrated aeronauts Montgolfier, who were born here, and of whom there is a statue in the Grande Place. Pop., 1901, 17,490; 1906, 17,300; 1911, 16,661.

AN'NUALS. A class of handsomely illustrated collections of prose and verse, imitating the gift-books of the Germans and intended for Christmas, New Year's, and birthday presents. The first, the *Forget-me-not*, was published in London in 1823 and was followed by the *Liter-*

ary *Souvenir*; the *Keepsake*, edited by Lady Wortley and subsequently by the Countess of Blessington; the *Book of Beauty*; the *Musical Bijou*; the *Comic Annual*, begun by Thomas Hood and others, and in the United States by the *Gift* and the *Token*, to mention a few of the many. Large sums were spent on these publications, and large profits were realized; but while many authors of distinction, as Tennyson, Longfellow, and Bryant, were induced to contribute to them, the articles, as a rule, were of an inferior and highly sentimental nature, and after 1840 the demand for annuals declined. The *Forget-me-not* had an unparalleled life of 22 years; but the *Book of Beauty* and the *Keepsake* survived it, the last named ceasing to exist in 1856. The tradition of the old annuals survives in the special Christmas numbers of many magazines. See YEAR BOOK.

ANNUALS, or MON'OCYC'LIC PLANTS.

Plants that live only during a single vegetative period. The aërial parts of many plants are annual, the subterranean parts being persistent, and these must not be confused with annuals.

ANNU'ITY (from Lat. *annus*, year). A sum of money paid annually. If perpetual, the right to receive the payment passes from the annuitant to his heirs. Such perpetual annuities are less frequent than life annuities, which may assume the most varied forms. In the simplest phase of the matter the annuitant receives a fixed annual payment during his life, the annuity being extinguished by his death. If upon the lives of several persons, the aggregate amount of the annuity only is fixed. On the death of one of the recipients, his share is distributed among the survivors, the last person receiving the whole amount which was formerly distributed. The annuity may begin immediately and stop upon the happening of some contingency, as marriage; or again, the annuity may not begin until a later date, in which case it is designated as deferred. Many other combinations can be and actually are devised. Such annuities arise either from testamentary dispositions or from contract. In the former case it is the desire of the testator to insure to the recipient an income fixed in amount either for life or for a lesser period. Thus, a father may provide an annuity for his daughter, to be terminated upon marriage. In case of an annuity resting upon contract, the annuitant, or some one for him, surrenders the use of a sum of money to another person who agrees to make fixed annual payments to the annuitant during the life of the latter. The annuity may be purchased by a single payment or a series of payments extending over a number of years. The latter is particularly applied to old age insurance, the object of which is to secure a fixed annual income after reaching a certain age. Such a contract between two individuals would be little more than a wager. No one can tell how long an individual may live, and one of the parties to the contract must gain at the expense of the other. When, however, the business is concentrated so that the party paying the annuities deals with a large number of persons, the same laws that make life insurance possible make this a calculable and legitimate enterprise. The relations of life insurance and annuities are obvious. They are reciprocals of one another. In life insurance a series of annual payments obtains for heirs of the insured certain capital at death of the insured, while in annuities the surrender of a certain capital in-

sure a series of annual payments during life. Annuities are, in fact, older than life insurance, and the latter is an offshoot of the former.

The elements in the calculation of the rates of annuities are the same as in life insurance, though the calculation is a different one. The first element is the probability of human life, as determined by vital statistics. Upon the length of human life depends the number of payments, and for a given capital, therefore, the amount of such payments. It is obvious that the sum of \$1000 would purchase a larger annuity for a man of 50 than for one of 25. It is equally clear that for a series of contracts once entered upon, a lengthening of the average period of human life would cause pecuniary loss to those paying the annuities, while a shortening of human life would cause a profit. Like results have frequently followed from undertaking annuity contracts upon an erroneous statistical basis. The second element in the case is the interest upon money. If the money surrendered at the outset were locked up in a strong box, the calculation of the payment for a fixed number of years would be simplicity itself. In that case an annuity of \$1 for 10 years could not be purchased for less than \$10. But the purchase money is, in fact, placed at interest, and under the terms of the contract above noted, the seller of the annuity would enjoy the interest on \$10 for one year, on \$9 for the second year, and so on. The purchaser, however, will not surrender his entire claim to interest, but will at least share it with the seller. Thus it follows that an annuity of \$1 for 10 years should be purchased for something less than \$10. How much less, will depend upon the rate of interest. If interest were 6 per cent, the annuity could be purchased more cheaply than if it were only 3 per cent. Changes in the rate of interest complicate the practical problem of executing annuity contracts.

Such contractual annuities as have been described are more frequent in Europe than in the United States. In Europe the earliest public debts were in the form of life annuities. The ill success of these ventures was one of the earliest stimulants to a scientific study of the laws of mortality. In European countries the issue of annuities is still carried on by the government as well as by private companies. The greater familiarity with annuities which prevails in England, for instance, explains the frequent allusions to the interest on the public debt as a multitude of perpetual annuities. The repayment of the principal not being contemplated, the investor in the funds acquires the right to receive a certain annual income, and this right is transferable to his heirs. Annuities are assuming new importance in the United States, owing to the fact that most life insurance companies are beginning to issue new and attractive forms of annuity policies.

The mathematical treatment of the subject is extensive, involving the preparation of mortality and investment tables. The formation of these tables is discussed in the *Assurance Magazine*, a journal of the Institute of Actuaries of Great Britain and Ireland.

The annuity may be chargeable only to the person of the grantor, or it may be a charge on specific personal or real estate. In either case, if given with words of inheritance, it will descend as real property, but for all other purposes it will be treated as personal property. In this

respect it differs from a rent charge (q.v.), with which it is often confused, but which is always charged on specific real estate and, whether inheritable or not, is always treated as real property. Annuities are classed by Blackstone (*Commentaries*, book ii, p. 40) with rents, franchises, etc., as incorporeal hereditaments (q.v.). Like other species of property, they are generally alienable, except in jurisdictions where by statute beneficiaries of trusts for the payment of annuities are not allowed to alienate their interests under the trust.

Consult Blackstone, *Commentaries on the Laws of England*; Kent, *Commentaries on American Law*, and the authorities referred to under the title INSURANCE.

AN'NULAR ECLIPSE. See ECLIPSE.

AN'NULA'RIA (Lat. *annulus*, a small ring). A genus of fossil plants found in rocks of Devonian, Carboniferous, and Permian ages, allied to the modern Equisetaceæ, or Scouring-Rushes, and consisting of fluted annulated stems bearing numerous narrow leaves arranged in whorls at the ring-like joints. *Annularia*, for so long a time considered to be plants of a distinct genus, are now known to be, together with the genera *Asterophyllites* and *Sphenophyllum*, merely heteromorphous leaves of the *Calamites*.

AN'NULA'TA, or **ANNEL'IDA** (Lat. *annulus*, a little ring). A phylum of animals, the annelids, comprising a large group of segmented, worm-like forms, mostly included by Linnæus in his class Vermes. They have a more or less elongated body, which is always composed of numerous segments. The first of these assumes, in many, the character of a head, but in some the head is not clearly set off from the trunk. They have no jointed appendages, but most of them are provided with bristles and hairs, called *setæ*, often in numerous bundles, which are of use to them in locomotion; some, which want these, are furnished with suckers at the extremities and employ them for this purpose; some remain fixed in one place. Their bodies are always soft and without external or internal skeleton; but some of them form for themselves a calcareous covering by exudation; others form coverings partly by exudation and partly by agglutination. Their blood is generally red, but not from red corpuscles, as in vertebrates; sometimes it is greenish or yellowish. The circulatory system is well developed in most annelids, though a few aberrant forms have it greatly reduced or even entirely wanting. It is generally what is called a closed system, i.e., the vessels of which it is composed are entirely shut off from communication with the body cavity. But in the leeches there is no sharp distinction between blood vessels and body cavity. There are always longitudinal vessels, usually two, sometimes four, the dorsal or lateral of which pulsate more or less. These longitudinal vessels are connected by a large number of transverse vessels. Some of these near the anterior end of the body are occasionally larger than the rest and are called "hearts," but there is no true heart. See ALIMENTARY SYSTEM; CIRCULATORY SYSTEM.

The nervous system consists of a pair of ganglia lying above the œsophagus, known as the brain, from which the nerve trunks arise. Usually there are two such trunks, which pass downward and backward around the œsophagus, meeting in the mid-ventral line and running backward to the rear of the body as a double

cord. On this there are ganglia in each segment. The sense of touch is usually acute in annelids and is often localized in tentacles and papillæ. Many species have eyes more or less highly organized; some have sensory pits, supposed to be smelling organs; some have sensory papillæ, which from their occurrence around the mouth are supposed to be organs of taste; and a very few have otocysts, or positional organs. In all annelids, except a few aberrant forms, excretion takes place by means of nephridia, and these are usually arranged a pair in each segment. These nephridia are coiled tubes, one end widened to form a funnel and opening in the body cavity, and the other opening to the exterior. See NERVOUS SYSTEM.

Respiration is either by gills, which are of very various structure and appearance, or through the surface of the body or some part of the alimentary canal. The latter varies greatly with the habits of the worms, but the anal opening is always at the posterior end of the body. The muscular system is usually well developed, for many of these worms are very active animals. The sexes are generally separate, but many annelids are hermaphrodites. Nearly all lay eggs, and these are sometimes provided with a shell. See RESPIRATORY SYSTEM; GILLS; MUSCULAR SYSTEM.

Annelids are widely distributed over the world; while the majority are marine, a large number are found in fresh water or in the earth. Many are carnivorous, but some are almost wholly vegetable feeders. Some are sluggish, but the majority are active, and some move with remarkable rapidity. They vary greatly in size, some being almost microscopic, while others are several feet long. They are usually dull-colored, but some, especially tropical species, are gorgeously arrayed. Aside from the part they play in the economy of nature as soil producers and scavengers, they are of little use to man. Leeches were formerly (and are still sometimes) used in medicine for blood-letting, and a few species are used as food by savages, notably the palolo-worm.

The classification of the annelids has always been a matter of great difficulty, as there are several other groups to which they seem to be related or which they superficially resemble. The matter is not definitely settled, but it seems best now to regard them as a phylum, or type, coördinate with Mollusca, Arthropoda, etc., containing two well-marked classes, and two others whose relationships are very obscure. The largest and most important of these classes is that of the *Chaetopoda*, in which the blood system is closed and the external rings of the body correspond to the internal segments. They have locomotive organs in the form of *setæ*, or appendages provided with them. The class includes a very great number of species of widely different structure and appearance, and the most convenient, though possibly not the most natural, way to divide it is into three groups, Polychæta, Oligochæta, and Myzostomida. The last named are a very small group of curious, degenerate annelids which live parasitically on crinoids. The body is flat and unsegmented and has neither circulatory nor excretory system. The second class is *Gephyrea*, containing marine Annulata "devoid of any trace of segmentation in the adult condition, without parapodia, and either without *setæ*, or with only a limited number." It includes *Sipunculus*, *Echiurus*, and a

few closely related forms. The third class is *Archi-annelida*, minute marine worms, faintly segmented, and represented by only two families—the Histriodrilidæ, parasitic on lobsters, and the Polygordiidæ; the larvæ of both are trochospheres. The fourth class is *Hirudinea*, the leeches, which have the blood system communicating with the body cavity, and the external rings are four or five times as numerous as the inner segments. They have no *setæ* and are provided with suckers. Consult Parker and Haswell, *Zoölogy* (New York, 1897). See EARTH-WORM; LEECH; NEREIS; SERPULA; WORMS; FOSSIL.

AN'NULET (Lat. *annulus*, dimin. of *annus*, a ring). 1. A term in architecture for a small fillet or band in relief encircling a shaft or capital. The annulet is several times repeated under the echinus of the Doric capital. (See ORDERS OF ARCHITECTURE.) The shafts of Moorish columns are often banded with several annulets, and in English Gothic architecture the shafts of a pier-cluster are frequently divided into two or more lengths by molded annulets. 2. *Annulet*, a ring, a charge in heraldry of frequent occurrence.

ANNUNCIADE, ăn-nŭn'shĭ-ăd, or **ANUNCIADA**, ă-nŭn'thĕ-ă'dă (Sp. *Anunciada*, annunciation). The name of several religious orders. 1. The religious Order of the Heavenly Annunciation, or of the Nuns of the Annunciation of Mary, was instituted by Maria Victoria Fornari at Genoa in 1604, after a very strict rule. The convents of the order at one time numbered 50 in France, Germany, and the Netherlands, but they have disappeared since the French Revolution, except the one in Genoa. 2. Another Order of the Annunciation, or of nuns of Mary's Announcement, or the Ten Virtues, was organized by Joanna, the daughter of Louis XI, in 1501, after her separation from Louis XII. It extended to 50 convents for the reception of poor gentlewomen, but was broken up at the Revolution. Some convents still exist in Belgium. 3. The Order of Knights of the Annunciation in Savoy, *Ordine Supremo dell' Annunziata*, now the first Italian order, known originally as the Order of the Neck Chain or Collar, was instituted in 1360 by Amadeus VI, Duke of Savoy. It received statutes from Amadeus VIII, as Anti-Pope Felix V, in 1409, was renewed in 1518 under the name of the Holy Annunciation, and in 1720 was raised by Victor Amadeus to be the first order of the kingdom of Savoy. The King is always grand master. The knights, who since 1720 are not limited in number, must be of high rank, and already admitted to the orders of St. Mauritius and St. Lazarus. They compose only one class. The decoration is a gold medal, on which is represented the Annunciation, surrounded by love-knots. It is usually worn suspended by a simple gold chain, but the proper collar or chain of the order is composed alternately of love-knots and roses. On the roses are engraved the letters F. E. R. T., which some interpret *Fortitudo ejus Rhodum tenuit*, in allusion to the defense of Rhodes by Amadeus V, and which others hold to signify *Frappes, entres, rompes tout*. Since 1680 the knights wear on the left breast a star embroidered in gold. The four officers of the order—the chancellor (always a bishop or archbishop), the secretary (usually the minister of foreign affairs), the almoner (usually the king's first almoner), and the treasurer—wear the decoration round the neck, sus-

pended by a sky-blue ribbon, accompanied by a star on the left breast. For details of costumes, etc., see Burke's *Book of Orders of Knighthood*, pp. 250 et seq. 4. A brotherhood of the Annunciation was established in Rome by Cardinal Turrecremata in 1460. Its primary object was to provide dowries for 12 poor girls, but it now supports 400 girls, to whom it gives 25 scudi (\$25) apiece if they marry, or 50 scudi apiece if they enter a convent. Pope Urban VIII (died 1644) left his entire private fortune (30,000 scudi) to the brotherhood.

ANNUN'CIA'TION, THE (Lat. *ad*, to + *nuntius*, messenger, newsbearer). The announcement by the angel to the Virgin Mary of the incarnation of Christ (Luke i. 26-38). The festival of the Annunciation is kept on March 25, which was for a long period the beginning of the legal year in England. The earliest authentic evidence of the celebration of this feast is in a canon of the Council of Toledo, held in 656.

ANNUNCIATION, THE. A subject frequently treated by religious painters, especially the Italian. The Virgin is commonly represented with needlework or with a book, according to the legends, while the archangel usually appears bearing a lily or cluster of lilies. Among well-known pictures with this title are paintings by Andrea del Sarto, in the Pitti Gallery, Florence; Fra Angelico, a fresco, in the cloisters attached to the church of San Marco, at Florence, a particularly delicate and characteristic treatment of the theme; also by the same, panels in the Gesù, Cortona, and in the Museum of Madrid; Fra Bartolommeo in the Louvre; Luca Signorelli, at Volterra, Italy, in a chapel of the Duomo; Titian and also Tintoretto, in the Scuola di San Rocco and elsewhere at Venice. Among Spanish painters it was often represented by Murillo in a number of pictures in Seville and Madrid, and among moderns by D. G. Rossetti, in the National Gallery, London, a noteworthy example of the pre-Raphaelite school, in which the Virgin is a portrait of Christina Rossetti.

ANNUNZIO, ăn-nŭn'dzĕ-ō, GABRIELE D' (1864—). A leading Italian novelist and poet. He was born at Francavilla al Mare, near Pescara. In his fifteenth year, while a student at Prato, he published his first collection of verse, *Primo Vere* (1879), followed at intervals by *In Memoriam* (1880), *Canto novo* (1882), *Intermezzo de rime* (1884), *Isotta Guttadauro* (1886), and *L'Isotteo e la Chimera* (1890). From the appearance of his first volume, in which he imitated Carducci, he was hailed as a poet of exceptional promise, although the naturalistic tone of many of his earlier poems, especially the *Canto novo*, provoked much censure. His first novel, *Il piacere* (translated under the title *The Child of Pleasure* (Boston, 1910), appeared in 1889 and was evidently written under the dominating influence of Maupassant and Bourget. In the main, it is a psychological study of a thorough-going egotist, whose affections are divided between two women and who in the end ruins the life of one of them as well as his own. His next volume, *L'innocente* ('The Intruder,' 1891), and *Giovanni Episcopo* (1892), are both powerful but gruesome stories, showing strongly the influence of the Russian school, and especially that of Tolstoy's *Kreutzer Sonata*. *Il trionfo della morte* ('The Triumph of Death'), the purpose of which was to establish in Italy "a modern narrative

and descriptive prose," appeared in 1894 and confirmed his reputation as a searching psychological writer, although its audacity has made it impossible to translate the volume in its entirety. About this time some of his volumes were translated into French by M. Herelle, and shortly after their appearance M. de Vogüé wrote a highly eulogistic appreciation of d'Annunzio for the *Revue des Deux Mondes* (1895), under the caption "La Renaissance latine," with the result that the young author suddenly awoke to an international reputation.

During the following years d'Annunzio's literary ideals seemed to undergo an interesting evolution. Grouping together his earlier novels, *Il piacere*, *L'innocente*, and *Il trionfo*, as the *Romances of the Rose*, he conceived the idea of a triple trilogy, the second and third groups to be respectively known as the *Romances of the Lily* and *Romances of the Pomegranate*. The first "Romance of the Lily," *Le vergini delle rocce* ('Virgins of the Rocks'), in which the influence of Nietzsche's doctrine of the Superman is pronounced, appeared in 1896. His long-promised *Fuoco* ('Flame of Life'), the first of the "Pomegranate" series, appeared in the autumn of 1900 and had a great "success of scandal." It is an apotheosis of poetry, physical beauty, and sensual love. It marks the beginning of a decline, more pronounced in his later novels, such as *Forse che sì forse che no* (1910). D'Annunzio also turned his attention to the drama, which it was his ambition to restore to the grandeur and unity of the classic Greek tragedy. In this he has been unsuccessful, for his dramas are usually devoid of action. His plays include *Il sogno d'un mattino di primavera* (1897), *Il sogno d'un tramonto d'autunno* (1898), *La città morta* (1898), *La Gioconda* (1898), *La Gloria* (1899), *Francesca da Rimini* (1901), *La figlia di Jorio* (1904), and *La fiaccola sotto il moggio* (1905), the last two dealing with the life of his native Abruzzi and revealing a marked advance in his dramatic art. The tragedies *La Nave* (1908) and *Fedra* (1909) were both failures. *Novelle della Pescara*, a collection of short tales modeled closely on Maupassant, appeared in 1902. His later lyrical work is contained in the *Laudi*, generally regarded as his finest achievement in poetry, a collection of songs to be completed in seven books dedicated to the pleiades and chanting the praises, as the full name tells, "of the heavens, the sea, the earth, and the souls of heroes." These later poems have been received with great enthusiasm in Italy, where d'Annunzio has been assigned a place in the front rank with Carducci. D'Annunzio is a firm believer in a new Renaissance—a Renaissance which will begin by "re-establishing the worship of Man," and which will "exalt and glorify above all things the beauty and power of man, the conqueror." His most recent works are *Il Martirio di San Sebastiano*, a mystery play originally composed in French and translated into Italian by Janni (1911), and *La Vita di Cola di Rienzo*, the first of a series entitled *vite di uomini illustri e di uomini oscuri* (1913). Though d'Annunzio is a very great artist, Borgese considers him the product of a materialistic age, incapable of a high ideal, which prevailed in Italy after the accomplishment of national unity. Consult: Borgese, *Gabriele d'Annunzio* (Naples, 1909); Collison-Morley, *Modern Italian Literature* (Boston, 1912); Gargiulo, *Gabriele d'Annunzio*

(Naples, 1912); Croce, "G. D'A.," *Critica* (Bari, 1910).

AN'NUS MIRABILIS (Lat. wonderful year; the year of wonders). The title of a poem by Dryden (1667) on England's naval successes in the war with Holland (1666) and on the great fire of London.

ANN'VILLE. An unincorporated town in Lebanon Co., Pa., 5 miles west of Lebanon, the county-seat; on the Philadelphia and Reading Railroad (Map: Pennsylvania, E 3). It is the seat of Lebanon Valley College (United Brethren in Christ), opened in 1866, and has manufactures of shoes, hosiery, etc. The town is governed by five commissioners elected by the people. Annville was laid out in 1762 and originally was called Millerstown, in honor of its founder. Pop., 1890, 1283; 1910, 2482.

ANO'A (native name). A genus of buffaloes, the smallest of all wild cattle, and represented by the sapi-utan of Celebes (*Anoa depressicornis*), having low straight horns, wide at the base. See Plate of BUFFALO.

AN'ODE (Gk. *ánodos*, *anodos*, a way up, from *aná*, *ana*, up + *ódós*, *hodos*, way). A term first used by Faraday to designate the positive terminal or conductor by which the current of a voltaic battery enters a substance, undergoing decomposition by electrolysis. The negative pole, or conductor, by which the current leaves the electrolyte, is called in the same nomenclature the *cathode* (*kata*, downward and *hodos*). *Electrode* is the general term applied to either of these. The products of electrolysis are called *ions* (*iōn*, going). Such as go to the anode receive the name of *anions*, and those passing to the cathode, *cations*. Thus, in the decomposition of water by the passage through it of an electric current between two platinum plates, the water is the electrolyte; the platinum plate connected with the copper or carbon of the battery is the anode; and the one connected with the zinc plate, the cathode. The oxygen and hydrogen which are disengaged are the ions, the oxygen separating at the anode forming the anions, and the hydrogen at the cathode the cations. See ELECTRICITY for a discussion of electrolysis; also ELECTRIC FURNACE and ELECTRO-CHEMISTRY.

AN'ODON'TA. A subdivision of fresh-water mussels of the family Unionidæ, characterized by having light, thin, smooth shells without hinge-teeth. They are abundant in both ponds and streams in America and most other countries. See Plate of ABALONE, ETC.

AN'ODYNE (Gk. *án*, *an*, priv. + *ódýnē*, *odynē*, pain). A remedy given to assuage pain. Properly the term is applied to medicines, such as opium, which act on the nervous system so as to diminish pain. Anodynes may induce sleep. See HYPNOTIC; ANÆSTHETIC.

ANOINTING (Lat. *inunctio*, from *in*, in + *ungere*, to smear, anoint). The custom of pouring oil on the head or of applying unguents to one's body. Anointing was widespread in the ancient Orient for secular as well as for religious purposes. In the Old Testament, where the custom is frequently referred to, the unguent used was olive oil, to which frequently aromatic spices were added. As a part of the regular toilet, anointing was associated with washing (e.g., Ezek. xvi. 9), but in days of mourning, anointing, which was regarded as a symbol of joy and gladness (e.g., Ps. xxiii. 5), was omitted. Head, face, and feet were the parts of the body to which the unguents were applied. The Hebrews

in thus using aromatic unguents no doubt simply followed general customs, and similarly the religious and ceremonial use of unguents was common to the ancient Orient. It was general to anoint kings as a symbol of initiation, and likewise priests and sacred objects were anointed. An interesting development growing out of the custom among the Hebrews was the use of the word *meshiach*, which means 'anointed,' in regard to the kings and the high priests who were anointed with oil, when they assumed their office. In later times the Aramaic form *mes-sicha*, whence the Greek *Μεσσίας*, *Messias*, *Messiah*, was applied to the King of David's line who was expected. The Greek translation *ὁ χριστός*, *ho Christos*, occurs in the Psalter of Solomon, with this significance, and becomes the title of Jesus in the New Testament.

As to the original significance of anointing as a religious rite, scholars hold different views. Some regard the oil as a substitute for blood; others look upon it as itself symbolizing life, fat being, according to ancient ideas, one of the seats of life. In either case the idea expressed by the religious and ceremonial anointing is that of establishing a covenant between the individual and the Deity, perhaps as the source of life of which the oil serves in some way or other as representative. It was the actual rubbing of the unguent over the head, face, or feet whereby direct communion between the individual and the unguent was brought about that constituted the essential part of the ceremony, and not the mere act of pouring it over the head of a person. In the course of time, however, as the custom became more and more merely a mark of honor, the pouring over the head became the customary form of anointing. In the New Testament anointing is merely referred to in the case of the sick; but the rite was adopted by the Roman Catholic and the various Oriental churches, and survives in the anointing of kings in England, Spain, and Russia. See also **CHRISM**; **CORONATION**; **EXTREME UNCTION**; and for anointing of the dead, see **EMBALMING**.

ANOKA, à-nō'ká. A city, the county-seat of Anoka Co., Minn., 18 miles north-northwest of Minneapolis, on the Great Northern, Minneapolis Northern, and the Northern Pacific railroads, and on Rum River (Map: Minnesota, D 5). Anoka has a Carnegie library and is the seat of a State asylum. Its chief industries include a sash and door factory, a motor company, and a starch factory. The commission form of government adopted (1913) provides for election of mayor and four commissioners biannually. Both the water works and electric light plant are owned by the municipality. Pop., 1890, 4252; 1900, 3769; 1910, 3972.

ANO'LIS (in the Antilles, *anoli*, *anoalli*, a lizard). A genus (containing over 100 species) and family (Anolidæ) of small, fine-scaled, iguanid lizards, with considerable ability to change color, numerous in the warmer parts of America and represented in the United States by one species (*Anolis carolinensis*). See **CHAMELEON**. For illustration, see **LIZARD**.

ANOM'ALIS'TIC YEAR. The interval that elapses between two successive passages of the earth through its perihelion, or point of nearest approach to the sun. If the earth's orbit had a fixed position in space, this period would correspond with that of a sidereal revolution, or the time the earth would take after leaving any point of the heavens to return to it again, as

seen from the sun; but the disturbing influence of the other planets causes the perihelion to advance slowly (about 11".6 annually) in the direction of the earth's motion; so that the anomalistic year is longer than the sidereal. Owing to the fact that the advance of perihelion is not quite constant, the length of the anomalistic year varies slowly, increasing at the rate of about 2.6 seconds in 1000 years. According to Newcomb, the length in 1900 was 365 days, 6 hours, 13 minutes, 53 seconds, or 4 minutes, 43.5 seconds longer than the sidereal year. It receives its name from the anomaly (q.v.).

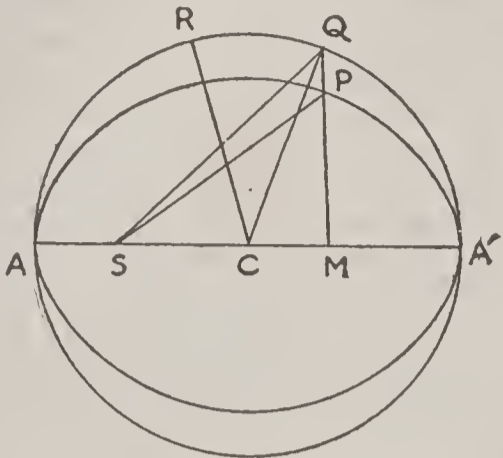
ANOM'ALISTS AND ANAL'OGISTS (for derivation, see below). Under this name were known in antiquity the representatives of the two opposing views of the origin of language. The science of grammar was developed among the Greeks in the Alexandrian Age (q.v.), although some beginning had been made in the earlier period, notably by Aristotle. (See **GRAMMAR**.) The Stoics concerned themselves with the origin of language and maintained that language was a natural growth, while the grammarians maintained that it was the product of convention. Chrysippus (q.v.) went further and taught that language was marked mainly by irregularities (*ἀνωμαλία*, *anōmalia*), and that not analogy, or law, but *consuetudo*, i.e., habit or usage, was the guiding principle of language; the Alexandrians, Aristophanes and Aristarchus, contended that regularity, analogy (*ἀναλογία*, *analogia*), was the rule, and that every departure from regularity is to be explained as an exception to the general law. (See **ANALOGY**.) The Pergamene school of grammarians, under the leadership of Crates (q.v.) of Mallos, adopted the anomalistic doctrine against the analogistic teaching of the Alexandrians. When Crates was sent on an embassy to Rome in the middle of the second century B.C., he transplanted his doctrine to that city; he accepted the phenomena of language as the arbitrary result of custom and usage. The Alexandrians' views, however, gained currency there somewhat later, and the contest between the two doctrines lasted a long time. Ælius Stilo, the teacher of Cicero and Varro, favored analogy; Cæsar wrote two books, *De Analogia*, now lost; and Varro (q.v.) devoted books viii-x, still extant, of his *De Lingua Latina* to a discussion of the two views. The analogistic view finally prevailed. Cicero was an analogist, but he gave great weight to *consuetudo*, going so far as to use forms which he knew to be wrong. As a matter of fact, neither the analogists nor the anomalists were wholly right; language is marked at once by analogy and by anomaly.

Consult: Wheeler, "Analogy and the Scope of its Application in Language," *Cornell Classical Studies* (Ithaca, 1887); Henry, *Etude sur l'analogie* (Paris, 1883); Paul, *Introduction to the Study of the History of Language*, translated and edited by Strong (London, 1888); Strong, Logeman, and Wheeler, *Introduction to the Study of the History of Language* (London, 1891), which is founded upon Paul's work; Sandys, *A History of Classical Scholarship*, especially vol. i, pp. 179-181 (Cambridge, 1906). See **PHILOLOGY**.

ANOM'ALOUS DISPERSION. This phenomenon will be found discussed in the article **LIGHT**, particularly in the section dealing with ether and matter.

ANOM'ALU'RUS. See **FLYING SQUIRREL**.

ANOM'ALY (Gk. *ἀνωμαλία*, *anōmalia*, irregularity, from *ἀν*, *an*, negat. + *ὄμαλός*, *homalos*, even, equal). The angle measured at the sun's centre between a planet in any point of its orbit and the last perihelion. It is so called because it was in it that the first irregularities of planetary motion were discovered. In the ac-



companying diagram, let *P* be a planet, *APA'* its orbit, *C* the centre of the orbit, *S* the sun, and *A* the perihelion, then the angle *ASP* is called the true anomaly. Besides the true anomaly, there are two other anomalies—the eccentric and the mean—which are defined as follows: Let *AQA'* be the semicircle described on *AA'* as diameter, *Q* the point in which the line *PM* drawn at right angles to *AA'* meets the semicircle; then the angle *ACQ* is the eccentric anomaly. The mean anomaly is the angle *ACR*, *R* being the position of a hypothetical planet which moves along the circumference of the semicircle with uniform velocity in such a way that, starting from perihelion *A* at the same time as the true planet *P*, it reaches aphelion *A'* simultaneously with *P*. The difference between the true and the mean anomaly is termed the *equation of the centre* on account of its being the first equation or correction to be applied to the mean motion in the computation of the place of a planet. Kepler's Problem, the solution of which is of a mathematical nature and may be found in treatises on spherical astronomy, consists in the determination of the true anomaly in terms of the mean anomaly.

ANON'YMOUS (Gk. *ἀν*, *an*, negat. + *ὄνυμα*, *onyma*, Æol. and Dor. for *ὄνομα*, *onoma*, name). A term applied to a book the author of which does not give his name; when an assumed name is given, the term "pseudonymous" is used. Works of this class constitute one of the greatest difficulties of bibliography. French literature possesses an excellent *Dictionnaire des ouvrages anonymes et pseudonymes* (4 vols., 3d ed., Paris, 1872-79), by Barbier, embracing the titles of about 24,000 works. The best works in English are: Cushing, *Anonyms* (Cambridge, Mass., 1890), and *Initials and Pseudonyms* (1st series, New York, 1885; 2d series, New York, 1888); Halkett and Laing, *Dictionary of Anonymous and Pseudonymous Literature* (4 vols., New York, 1882-88); Olphar Hamst, *Handbook of Fictitious Names* (London, 1868).

In France and Germany literary criticism, when it extends beyond a brief notice, usually bears the author's name. In Great Britain and the United States there is no uniform practice, though reviews are more commonly unsigned.

ANON'YMUS CUS'PINIA'NI. The Latin designation of an important anonymous manuscript, so called from the name of Joseph Cuspinianus, the scholar who brought it to notice

about the beginning of the sixteenth century. It is an historical account of the quarter-century preceding the fall of the Western Roman Empire. The manuscript is in the Imperial Library at Vienna.

ANOPHELES, ä-nöf'ë-lēz (Gk. *ἀνωφελής*, *anōphelēs*, useless, harmful; from *ἀν*, *an*, priv. + *ὠφέλεια*, *ōpheleia*, help, use). A genus of mosquitoes which form the secondary hosts of malarial parasites and communicate disease. See MOSQUITO.

AN'OPLOTHE'RIMUM (Gk. *ἀνοπλος*, *anoplos*, unarmed + *θηρίον*, *thērion*, wild beast). A genus containing several species of artiodactyl mammals that lived during late Eocene and early Oligocene time in France and the British Islands and that soon became extinct without leaving descendants. The remains of one species, *Anoplotherium commune*, of the size of a deer, occur in such abundance in the early Tertiary beds of the Paris Basin as to justify the conclusion that these animals ranged the forests of Tertiary time in immense herds in much the same manner as do the deer of the present day. The feet were provided with three digits, two of which were of equal size and of some length, while the third was in the form of a reduced dew-claw. *Anoplotherium* is by some authors placed in close relation to the Oreodonts, by others to the Hippopotami. See TERTIARY SYSTEM.

AN'OREX'IA. Loss of natural appetite for food. It is always a symptom of fevers and acute illness. Lack of appetite is a characteristic of many gastric disorders, chronic alcoholism, grief, anxiety, and certain nervous diseases. There may be merely an absence of the hunger sense, or there may be a positive aversion, to the extent of bringing on nausea at the sight of food. Anorexia is not seldom due simply to an excess of nourishment or to eating at too frequent intervals.

ANOR'THITE (Gk. *ἀν*, *an*, priv. + *ὀρθός*, *orthos*, straight; i.e., without right angles). An aluminum calcium silicate of the feldspar group of minerals. It crystallizes in the triclinic system and is found in prismatic crystals in many volcanic rocks; it has also been recognized as a constituent of certain meteorites.

ANOR'THOSITE (Fr. *anorthose*, triclinic feldspar; see ANORTHITE). An igneous rock related to the gabbro family, composed largely of that variety of feldspar, rich in lime, known as labradorite. Anorthosite has a granitoid but generally also a parallel structure, and in addition to labradorite feldspar contains often augite, hypersthene, hornblende, etc. It contains on an average about 55 per cent of silica, 28 of alumina, 10 of lime, 5 of soda, and 1 of potash. An obsolete name is labradorite rock. Anorthosite has been described from the Adirondack Mountains of New York, where it forms the central more mountainous part, including the Mount Marcy group, from Canada and Newfoundland, and from southwestern Norway. It occurs also about Lake Superior. See GABBRO; LABRADORITE.

ANOS'MIA (Gk. *ἀν*, *an*, priv. + *ὀσμή*, *osmē*, smell). A medical term, denoting a loss of the sense of smell. It may be due to causes acting either on the terminals of the olfactory nerve, peripheral, or on that part of the nerve which is within the brain, central.

ANQUETIL, änk'tél', LOUIS PIERRE (1723-1806). A French historian. At the age of 17 he joined the congregation of St. Geneviève;

was director of the Seminary of Rheims, and afterward director of the College of Senlis. In the Reign of Terror he was imprisoned in St. Lazare. He was an early member of the Institute and secured a place as archivist in the department of foreign affairs under Napoleon. His best work was his *Histoire de Reims* (1756-57). He also wrote several volumes of memoirs, such as *Louis XIV, sa cour et le régent* (1789; Eng. trans., Edinburgh, 1791); and an incomplete *Histoire de France depuis les Gaules jusqu'à la fin de la monarchie* (1805). His *Summary of Universal History* was published in English in Philadelphia (1805-09).

ANQUETIL-DUPERRON, du'pâ'rôn', ABRAHAM HYACINTHE (1731-1805). A French Orientalist, born in Paris. He studied theology and Oriental languages and in 1754 enlisted as a private soldier for India. There, after securing the support of the French government, he passed seven years in the collection and collation of manuscripts and studied the language and doctrines of the Parsees. He returned to France in 1762, was elected a member of the Academy of Inscriptions in 1763, and in 1771 published *Zend-Avesta, ouvrage de Zoroastre*, 3 vols., the first translation of Parsee religious works ever made into a European language, about the exactness of which a fierce polemic arose. His further publications include *Legislation orientale* (1778); *Recherches historiques et géographiques sur l'Inde* (1786) as part of Thieffenthaler's *Geography of India; L'Inde en rapport avec l'Europe* (1790); and *Oupnek'hat* (1801-02), a Latin translation of a Persian rendering of the Sanskrit *Upanishads*, noteworthy as the source of Schopenhauer's knowledge of the Indian philosophy by which his own system was not slightly influenced. Consult Sir T. E. Perry, *Bibliographical and Historical Miscellanies of the Philobiblon Society*, vol. iii (1856-57), and A. F. Weber, *Indische Studien* (1853).

ANSÆ (Lat. *ansa*, a handle). The two handle-like projections on the planet Saturn which are observed whenever the rings are tilted with reference to the earth. Galileo, writing to the Grand Duke of Tuscany, announced that the planet, as seen through the then newly invented telescope, appeared to be *tricorps*, and later observers likened the projections to two handles, until Huygens, in 1655, discovered their true nature.

ANSARIES. See NOSAIRIANS.

ANSBACH, äns'bäg, or **ANSPACH** (originally Onolzbach). A town of Bavaria, capital of the circle of Middle Franconia (*Mittelfranken*), on the Rezat, 25 miles southwest of Nuremberg (Map: Germany, D 4). Its only notable buildings are the churches of St. Gumbert and St. John, and the castle, once the residence of the margraves of Ansbach, containing a library and picture gallery. The town has several schools, a synagogue, a theatre, and a public slaughter house. It has iron foundries, breweries, dyeworks, and spinning mills; manufactures vehicles, paper, liquors, tobacco, earthenware, toys, and hardware, and has a considerable trade in wool, flax, and grain. Ansbach sprang up around a Benedictine monastery founded by St. Gumbert in the eighth century. It was the capital of the principality of Ansbach, which from the close of the Middle Ages was for three centuries ruled by margraves of the Franconian branch of the House of Hohenzollern (of Brand-

enburg, later of Prussia). After belonging for a short time to Prussia, Ansbach and its territory, together with the old principality of Bayreuth, which had also been ruled by margraves of the Hohenzollern line and had shared the fortunes of Ansbach, were transferred by Napoleon I to Bavaria in 1806. Pop., 1890, 14,200; 1900, 17,555; in 1905, 18,478; 1910, 19,995.

ANSCHÜTZ, än'shuts, HEINRICH (1785-1865). A German actor. He was born at Luckau and studied at the University of Leipzig, in which city he saw the performances of Iffland, Esslair, and other distinguished actors who occasionally played there. He began his career as an actor at Nuremberg in 1807 and finally became a member of the Hofburgtheater in Vienna. He played both heroic and character parts and was for many years the central figure at the famous playhouse. An autobiography under the title, *Heinrich Anschütz, Erinnerungen aus dessen Leben und Wirken*, was published in Vienna (1866).

ANSCHÜTZ, KARL (1815-70). A German musician. He was born in Coblenz and in 1857 settled in New York, where he became well known chiefly as a conductor of opera and as a pioneer manager of German opera. He was also conductor of the Arion Society (1860-62). Consult F. L. Ritter, *Music in America* (New York, 1895).

ANSCHÜTZ, OTTOMAR (1846—). A German photographer, born at Lissa, in Posen. He devoted himself to instantaneous photography and to reproducing the movements of men and animals with the aid of a "tachyscope" of his own invention. (See STROBOSCOPE.) Anschütz's invention has been applied to useful purposes in physiology.

ANS'DELL, RICHARD (1815-85). An English genre and animal painter, born at Liverpool. He studied art at the local academy, but acquired most of his training by independent sketching and study travels in the north of England and Scotland. In 1847 he removed to London and in 1856-57 visited Spain, which influenced both his subjects and technique. In 1870 he was elected to the Royal Academy. After Landseer, who greatly influenced him, he was the most popular animal painter of England, with a wide range of subjects, made interesting by a dash of human sentiment. He was good in composition, but his animals are not really true to nature. His historical subjects, which attracted much notice earlier in his career, were poor. Ansdell was also a skillful etcher, and examples of his art may be seen in the galleries of Manchester and Liverpool. His best painting is the "Combat of Red Stags."

ANSE D'ARLET, äns' där'lä'. An attractive seaport town on the southwest coast of Martinique, in the canton of Diamaut, directly south of Trois Ilets. Near by is a hot spring, and there are many plantations on which are grown cotton, cacao, and coffee. Pop., about 3000.

ANSE DE PANIER, äns de pâ'nyâ' (Fr. handle of a basket). The equivalent of basket-handle arch. An architectural term for three-centred arches.

ANSELL, MARY. An English actress, who after two years of theatrical experience made a success in 1893 as Nannie O'Brien in *Walker, London*. The next year she retired from the stage to marry the author of the play, J. M.

Barrie, the novelist, at Kerriemuir (July, 1894). In 1913 she published *Happy Houses*.

AN'SELM OF CANTERBURY, SAINT (1033-1109). A scholastic philosopher, born at Aosta, in Piedmont. He led at first a dissipated life and, like Abélard, wandered through France, after the fashion of the scholars of those days, disputing wherever he could find an adversary. Attracted by the reputation of Lanfranc, he went, in 1060, to study at the monastery of Bec, in Normandy. Three years later he became prior, and, in 1078, abbot of this monastery, which under him became famous as a seat of learning. Lanfranc, who in the meantime had gone to England and become Archbishop of Canterbury, died in 1089; and the archdiocese remained four years without a successor, till, in 1093, Anselm was appointed. He was distinguished as both a churchman and philosopher. His numerous embroilments with William Rufus and Henry I, and the unbending spirit which he displayed in these, even when subjected to banishment, indicate the vigor and resoluteness of his character, as much as his writings exhibit the depth and acuteness of his intellect. In 1720 Clement XI expressly placed him in the list of Church authorities. Anselm was a second Augustine, superior to all his contemporaries in sagacity and dialectical skill and equal to the most eminent in virtue and piety. Embracing without question the doctrines of the Church, mostly as stated by Augustine, and holding that belief must precede knowledge and must be implicit and undoubting, he yet felt the necessity of a religious philosophy, urged the duty of proceeding from belief to knowledge, and sought to reduce the truths of religion into the form of a connected series of reasonings. It was for this purpose he wrote his *Monologium sive Exemplum Meditandi de Ratione Fidei*. In his *Proslogium*, otherwise entitled *Fides Quærens Intellectum* ('Faith Seeking Intellect'), he strove to demonstrate the existence of God from the conception of a perfect being. This ontological proof, however, has never been held satisfactory. His writings, *Cur Deus Homo* and *De Concordia Præscientiæ et Prædestinationis*, made an epoch in Christian philosophy. Anselm may justly be reckoned the earliest of the schoolmen, although Alexander of Hales (q.v.) was the first who completely systematized in the scholastic manner the doctrines of the Catholic church. He died in Canterbury, April 21, 1109, and was buried there. The day of his death is observed in the Roman Catholic church. His works are in Migne, *P. L.*, 158, 159, and a few pieces since discovered in Mai, *Nov. Bibl. I.* For his life and teachings, consult: F. R. Hasse (Leipzig, 1843-52); De Rémusat (Paris, 1858); R. W. Church (London, 1870); M. Rule (London, 1883), who also edited two lives of Anselm by Eadmer for the Rolls Series (London, 1884); J. M. Rigg (London, 1896); A. C. Welch (London, 1900). In English are his *Book of Meditations and Prayers* (London, 1872); *Cur Deus Homo*, with selections from his letters and life (London, 1889); *Monologium, Proslogium, and Cur Deus Homo*, edited by S. N. Deane (Chicago, 1903).

ANSELM OF LUC'CA. See ALEXANDER II (POPE).

ANSERES, ān'sēr-ēz (Lat. nom. pl. of *anser*, goose). An order of birds, also called Anseriformes, including the ducks, geese, and swans (q.v.), and characterized mainly by the fact that

the edges of both mandibles are provided with a series of tooth-like projections, those of the upper alternating with those of the lower mandible. The Anseres are found in all parts of the world, and about 200 species are known, mostly of large size. With few exceptions, they are essentially swimming birds and are never found far from water. They breed near the water, lay numerous eggs, and the young are able to care for themselves almost as soon as they are hatched.

ANSGAR, äns'gär (ANSKAR, or ANSCHARIUS) (801-865). A French prelate, styled "the Apostle of the North," on account of his labors to introduce Christianity into Denmark, Sweden, and northern Germany. He was born near the monastery of Corbie, in the vicinity of Amiens, France. In this monastery and that of Korvei, in Westphalia, an offshoot of the former, he was educated, and in the latter he subsequently became preacher. His family belonged to the Frankish nobility, and under the patronage of Louis de Débonnaire he went, with his colleague Autbert, to preach the doctrines of Christianity among the heathen Northmen of Schleswig, where he suffered many persecutions, but had, nevertheless, such success that in 831 the Pope established an archbishopric in Hamburg, and Ansgar was appointed the first archbishop. Here he passed through many difficulties, being compelled to save his life by flight in 845, when the Northmen and Danes under Eric I plundered Hamburg. He afterward made several missionary tours in Denmark and Sweden, and died Feb. 3, 865, at Bremen, where a church was named after him. The Roman Catholic church has canonized him. For his life, consult: G. H. Klippel (Bremen, 1845); Tappehorn (Münster, 1863); A. Butler, *Lives of the Saints*, under February 3 (London, 1847).

AN'SON, GEORGE, LORD (1697-1762). An English admiral and famous circumnavigator. He was born at Shugborough, Staffordshire, April 23, 1697. From an early period he manifested a predilection for a sea life, and entered the navy at the age of 15. In 1716 he served as second lieutenant under Norris; next under Byng in 1718, against the Spaniards; and was made a captain in 1723. In 1739, when war with Spain broke out, he was recalled from the Carolina station, on which he had been placed since 1724, and received the command of the fleet in the South Sea. He sailed from England in September, 1740, with instructions to inflict whatever injury he could on the Spanish commerce and colonies. The preparations for this cruise had been made in the most slovenly manner. Both vessels and stores were bad, and the sailors were old Chelsea pensioners; yet Anson, in spite of these disadvantages, achieved a brilliant reputation by the heroism, prudence, diligence, and humanity he displayed. After his little fleet of seven vessels had been scattered by a storm in doubling Cape Horn, he landed at Juan Fernandez, where he was soon joined by three of his ships, which arrived in a dismantled condition. Under great disadvantages he took several prizes, including a valuable Spanish galleon from Acapulco. Finally, with only one vessel left, he crossed the South Sea, doubled the Cape of Good Hope, and, favored by good fortune, was hidden by a thick fog as he passed through the French fleet and entered the English Channel. He arrived at Spithead, June 15, 1744, and his accumulated treasure, amounting to £500,000, was landed at Portsmouth, sent up to

London, and triumphantly paraded through the city in 32 wagons. He had circumnavigated the globe in three years and nine months, and his perilous cruise greatly extended the knowledge of navigation and geography. It has been described in his *Voyage Round the World* (editors Walter and Robins, 1748; new ed., 1853; in Everyman's Library, New York and London, 1911). As a reward for his services, Anson was made rear-admiral of the blue (1744), and in 1747, having defeated the French admiral Jonquière, at Cape Finisterre, he was created Baron Soberton, and four years later first lord of the admiralty. In 1761 he was made admiral of the fleet. Consult *Life*, by J. Barrow (London, 1839), and M. V. Anson (London, 1912).

ANSON, G. W. (1847—). An English actor, born at Montrose, N. B. He began his career at the Theatre Royal, Edinburgh, in 1865. After touring in the provincial towns and in America, he made in 1873 his London début, in *Sour Grapes*, at the Olympic Theatre, where he was engaged for several years. In 1880 he played Gaston Rieux, in *Heartsease*, with Madame Modjeska at the Court Theatre, and continued in London in various comedy parts till 1885, when he went to Australia for an extended stay. In 1892 he appeared in *The Lucky Dog* at Terry's Theatre, London. Among his subsequent rôles have been those of Schwartz, in *A Bunch of Violets*, at the Haymarket (1894); Hilarius, in *La Poupée*, with Anna Held, at the Lyric Theatre (1887), and Nero, in *Quo Vadis*, at the Adelphi (1900). During the years 1908, 1909, he appeared in the Shakespearean rôles of Old Gobbo in *The Merchant of Venice*, Sir Toby Belch in *Twelfth Night*, and Ligarius in *Julius Caesar*.

ANSO'NIA. A city in New Haven Co., Conn., 12 miles west by north of New Haven, on the Naugatuck River, and on the Berkshire and Naugatuck divisions of the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 4). Among the more prominent features of the city are the public library, built by Caroline Phelps Stokes as a memorial to her grandfather, Anson G. Phelps (q.v.), the founder of Ansonia, the Young Men's Christian Association Building, the Opera House, and the City Hall. A concrete bridge spanning the Naugatuck River has recently been completed at a cost of \$175,000. Ansonia is noted as a manufacturing centre, the products including heavy machinery, rolls for paper making and wheat milling, rubber, sugar, copper, brass, and wire goods, electrical appliances, clocks, etc. The government, under a charter of 1901, is vested in a mayor elected every two years, a municipal council, and administrative officials, the majority of whom are appointed by the mayor with the consent of the council. Settled in 1840, Ansonia was set off from Derby in 1889 and was chartered as a city in 1893. Pop., 1890, 10,342; 1900, 12,681; 1910, 15,152.

ANSPACH, ä'n'späg. See ANSBACH.

ANSPACH, or ANSBACH, ELIZABETH BERKELEY, MARGRAVINE OF (1750–1828). An English dramatic writer. She was a daughter of the Earl of Berkeley and was married in 1767 to Mr., afterward Lord, Craven, but separated from him 13 years later. In 1791 she became the wife of the Margrave of Anspach, with whom she had been some time intimately associated at his court. She and her husband were not received, when they came to England,

either by her family or by royalty, even after she had been created a countess of the Empire by the German Emperor, Francis II. Her wanderings, after the Margrave's death, in 1806, finally ended at Naples, where she spent her last years. Her literary work included poetry, travels, and the plays: *Somnambule* (1778); *The Silver Tankard*, a musical farce (Haymarket, 1781); *The Princess of Georgia* (Covent Garden, 1799); and *Love in a Convent* (1805), in which she herself took part. She also wrote the curious *Memoirs of the Margravine of Anspach* (London, 1825).

AN'STED, DAVID THOMAS (1814–80). An English geologist and mining engineer. He was born in London and received his education at Jesus College, Cambridge. In 1840 he became professor of geology at King's College in London and afterward occupied a similar position at the Putney College of Civil Engineering. His works include: *Geology, Introductory, Descriptive, and Practical* (2 vols., 1844); *Gold-seeker's Manual* (1849); *The Applications of Geology to the Arts and Manufactures* (1865); *The World We Live In* (1870); the fifth edition of his *Physical Geography* appeared in 1871, four years after its first publication.

AN'STER, JOHN (1793–1867). An Irish educator and poet. He was born in Cork Co., Ireland, and was educated at Trinity College, Dublin, where he was regius professor of civil law (1850–67). Besides making contributions to several literary periodicals, he published *Poems and Translations from the German* (1819); a translation of the first part of Goethe's *Faust* (1835); and *Faustus, the Second Part, from the German of Goethe* (1864).

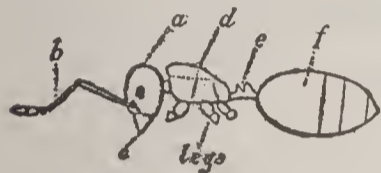
ANSTEY, ä'n'stī, CHRISTOPHER (1724–1805). An English poet and humorist, who was educated at Eton and Cambridge. In his time the two great English universities were representative of a low order of scholarship, such as Gibbon and the poet Gray have vividly pictured in styling them "the home of bats and owls." Anstey, in his Latin oration for the degree of Master of Arts, boldly satirized the conditions which then existed, speaking of *doctores sine doctrina*. Because of his frankness the degree was refused him by the indignant dons. In 1776 he wrote a series of papers, collectedly called *The New Bath Guide, or The Members of The Broadhead Family at Bath*. The lively and piquant satire of this keen critic attracted a large body of readers, who were greatly amused by his observations on society and the manners of a certain class of English; and the book was popular for many years, though his other publications are now forgotten.

AN'STEY, F. See GUTHRIE, THOMAS ANSTEY.

AN'SWER (AS. *and-*; Ger. *ant-* in *Antwort*, answer, Gk. *ἀντί*, *anti*, against + *swerian*, to speak, swear). In law, technically the pleading interposed by the defendant to the plaintiff's bill in an action brought in a Court of Chancery. In his answer the defendant may set up any matter of defense to the plaintiff's claim, but in addition he is required to state fully under oath his knowledge, or, if he has no knowledge, his information and belief, as to all relevant matters alleged or inquired of in the plaintiff's bill. The method of pleading is technically known as giving discovery, and the information thus obtained may be used as evidence in the plaintiff's favor at the trial. It is subject, however, to the rule of chancery

practice, that, if unfavorable to the plaintiff, it is conclusive unless overcome by two witnesses or by one witness and corroborative circumstances. The plaintiff, however, may avoid this consequence by expressly waiving an answer under oath in his bill. At law, as distinguished from equity, the defendant's pleading is technically known as the *plea*; but under the modern statutory system of pleading, the term "answer" is applied indiscriminately to the defendant's plea in either law or equity. See PLEA; PLEADING, and the authorities there referred to.

ANT (AS. *amete*; Ger. *Ameise*; from OHG. *meizan*, to cut, the original meaning thus being 'cut in'; as in Gk. *έντομος*, *entomos*, Lat. *insectum*). A small hymenopterous insect of the family Formicidæ, closely related to the wasps and bees, not only in structure, but in instincts and socialistic economy. "Emmet" is an older form of the word "ant" still in use, and "pismire" is another word occasionally heard. Ants are easily recognized by the well-known form of the body. The demarcation between head, thorax, and abdomen is very noticeable in these insects. From the termites and velvet ants, which most resemble them, true



PARTS OF AN ANT.

a, head; b, antenna; c, jaws; d, thorax and legs; e, pedicel; f, gaster.

ants can readily be distinguished by the peculiar form of the abdomen, the first or first one or two segments of which are constricted off, to form separately jointed small knobs or scales, which greatly increase the flexibility of the body.

Classification. The ants, according to the best authorities, form a single family, Formicidæ, divided into five subfamilies. The subfamilies are founded mainly on the condition of the peduncle or part constricted off from the abdomen (whether composed of one or two portions), and on the presence or absence of a sting.

Polymorphism and Division of Labor. As in other social insects, there is, first of all, a dimorphism of the female sex. But among ants complexity of form goes further than this, on account of the complexity of the social organization. For the ant colony frequently contains enslaved individuals belonging to another species. The different forms of a species of ant are the results of division of labor among the members of the colony. Of the infertile females or workers, some are gatherers of food, some are nurses for the young, while others, of a larger size, act as soldiers to protect the ranks of foraging workers. In certain species certain workers serve as living storehouses. (See HONEY-MAKING ANTS.) Each of these differences in labor is associated with a difference in form. Even among individuals of the same sex and caste, considerable variability occurs. Although the workers are usually wingless, certain ones have been observed with short wings. A part or all of the fertile females may be wingless. Occasionally wingless males may exist together with the winged, while the wingless prevail in a few species.

The Origin and Maintenance of Colonies. Upon the appearance of the winged males and females in the ant colony, both are guarded by the workers until a suitable time for flight. Finally, they are let out on warm days in sum-

mer and autumn to appear in the air in myriads. Mating nearly always takes place while on the wing. Soon after mating, the males die, and those females that escape enemies and inclement weather settle down to the ground, tear off their wings, and make excavations in materials suitable for the construction of their nest. The eggs are then laid, and upon hatching, the larvæ are fed on some substance already stored up within the body of the queen, since she never goes out for food. When the workers of the first set, which are of small size, appear, the care of the larvæ and pupæ devolves upon them, and thereafter the queen devotes herself exclusively to egg-laying. Thus a new colony is established. Frequently one or more young queens are found by workers and conveyed to colonies already established, which they continue to maintain should the former queen be old. Thus more than one queen-ant may, without quarrels, live in a single colony. The workers feed the queen, and follow her on her wanderings throughout the passages and chambers. As she lets fall the eggs, the workers carry them to suitable locations. In the queen's presence they not infrequently perform those same peculiar antics and capers which they employ to express their emotions upon the return of a lost comrade. The legless larvæ and the pupæ are carried to the surface layers by day, for the sake of the sun's warmth, and at night, or during rain, to deeper and drier chambers. The larvæ are fed by the nurses on regurgitated liquid, or on a substance elaborated by them. They are carefully licked and rubbed by the nurses to keep them clean, and when the time arrives for the pupæ to emerge from their silken or naked sheaths, the workers are at hand to help them out and to unfold and dry their wings and legs.

Food. As is the case with all the other labors of the colony, getting the food devolves upon the workers. All sorts of available matter, of either animal or vegetable origin, both dead and freshly killed, serve them for food, and they are fond of sweets. The nectar of flowers and the sweet saps and juices of plants and fruits are sought. Sugar is ever a temptation to them. The honey-dew excreted by plant-lice, the "milch-cows" of ants, is especially prized. To secure it ants will climb even high trees. They follow the aphides about so as to catch the sweet excretion and even stroke them to hasten its expulsion. When the sap supply for the aphides fails, the ants carry their "cows" to new food-plants, and when winter comes on both the adult plant-lice and the eggs are carried out of reach of frost into the ant caverns and carefully attended until spring, when they are again placed on the swelling plant-buds. In warm lands several kinds of ants, such as the agricultural ant (q.v.) of Texas, are said to rear, harvest, and store grain, but there is every reason to believe that this statement is based on faulty observation. This habit has been ascribed to certain American ants of the genus *Pogonomyrmex*, especially to the Texan harvester (*P. barbatus*), but Wheeler has shown that the circle of tall grass, sometimes found around the nest of this species, is not sown by the ants, but springs up from the seeds that have accidentally germinated in the nest during moist weather and have been thrown out as refuse by the insects. Some ants,

studied by Belt in Nicaragua and by Bates in Brazil, accumulate bits of leaves within their caverns or line the walls with them. On the leaf-bits a fungus grows, or is planted, which serves the ants as food. While often very destructive to crops and stored supplies, ants such as the hunting-ants of South America, or the driver-ants of Africa, are useful scavengers; for not a bedbug, booklouse, moth, cockroach, mouse, or rat is overlooked by their myriad numbers. See DRIVER ANT; FORAGING ANT; LEAF-CUTTING ANT; SAUBA ANT.

Nests and Nest Building. In their nest building ants differ from all other social Hymenoptera. The nests or combs of bees are divided into even compartments or cells, whose walls are made of wax, while those of social wasps are built of papery pulp, derived from masticated weather-worn wood. In each cell one egg is laid and one individual is reared. The young of ants, on the other hand, are kept in heaps and moved about from one part of the nest to the other as conditions of temperature and moisture demand. The nests are composed of a variable number of chambers, of irregular shape, connected by galleries. They are usually excavated in the ground, often under the shelter of a stone, or in rotting or living trees, shrubs, or herbs. The chambers and galleries which are excavated in the earth extend a considerable distance down to the region of constant moisture. Some of the sauba ants of South America are said to cross wide rivers by tunneling under the river-beds. Not infrequently the nests are carried above the level of the ground by means of earth heaped up and often cemented together. Some ant-hills are thatched by bits of herbage. In South America ant-hills often exceed the height of man. Some ants tunnel out homes in the trunks of trees, others burrow in the thorns or petioles of leaves. Certain ants make homes by bending leaves in circles. The adult ants cannot produce cement, so the larvæ nearly ready for the pupa stage are utilized. Some of the workers hold the bent edges of the leaves in place, while others bring up the larvæ, whose heads they dab back and forth over the edges of the leaves so as to bind them together with silk.

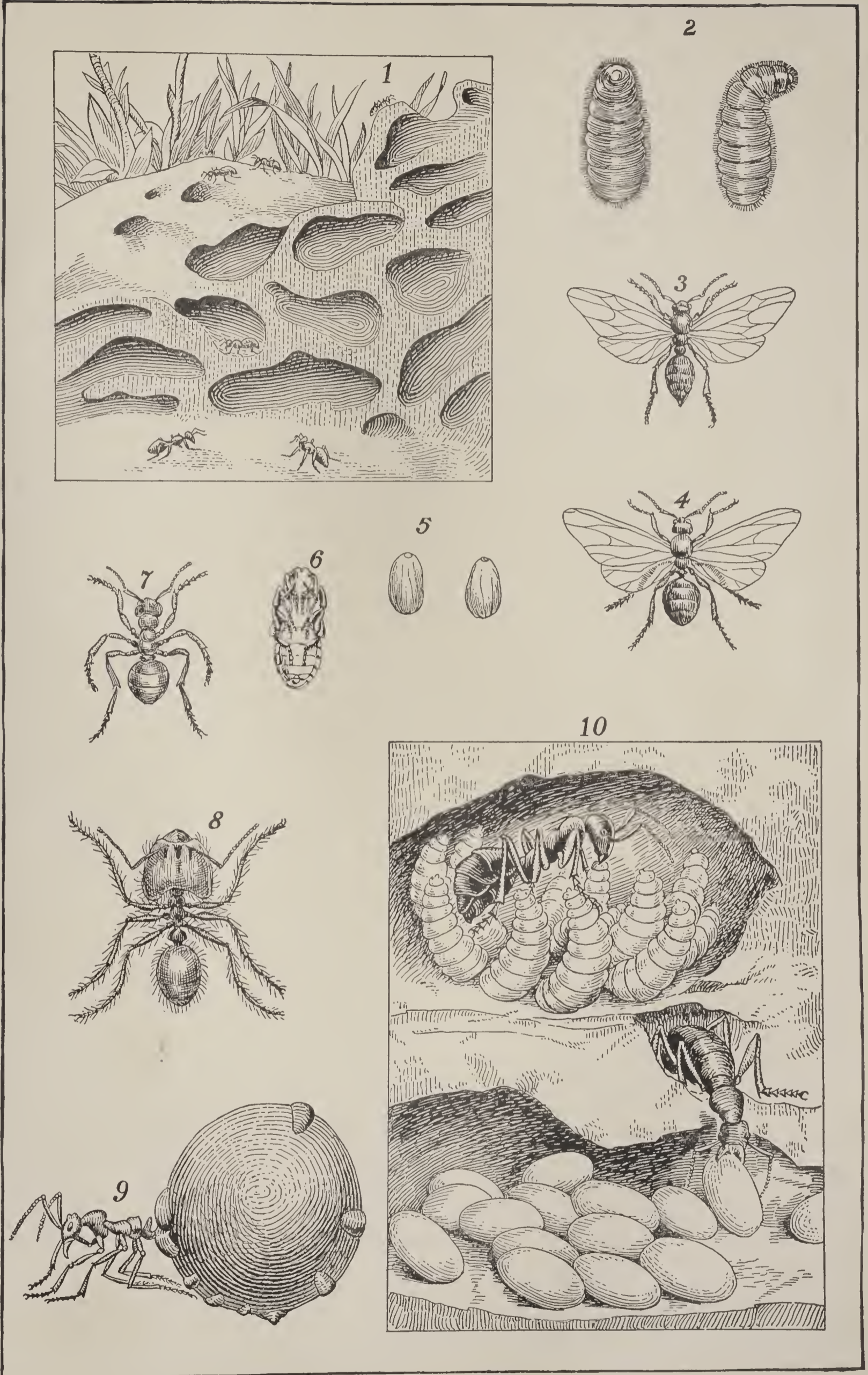
Symbiosis. Although certain ants are very destructive to vegetation, the relationship between ants and certain plants is sometimes one of mutual advantage, a symbiotic one. Thus, in South America, there is a small acacia known as the bull's-horn thorn, on account of the paired, horn-shaped thorns borne on the tree. While the thorns are still young the ant pierces a hole in the tip of one of them and then makes its way through the thorn to the base, where it tunnels into the other thorn. At the base of each young bipinnate leaflet on this same tree there is a honey-secreting gland, and at the tip a minute, pear-shaped fruit. The fruit does not all ripen at the same time; hence the ants (*Pseudomyrma*) are kept continually running over the tender foliage in search of edible stages. When the tree is disturbed, the ants swarm out of their nests in the thorns, and by their severe sting drive off intruders, such as caterpillars and even vertebrates. But they are most valuable to the tree in warding off the leaf-cutting ants that in a few hours can defoliate a tree. In the leaf petioles of another plant (*Melastoma*) there are two pouches. In

these ants find homes, and, in return, they keep off the leaf-cutting ants and foliage-eating foes. The young, tender leaves of certain orchids and passion-flowers have honey-glands visited by ants to the exclusion of all marauders.

Relations of Different Species to One Another. Almost all kinds of ants carry off the larvæ and pupæ of other kinds of ants for food. At times, doubtless, more are taken than can be consumed; hence some of the captives come to maturity in the foreign nest. Perhaps in some such way as this, out of the instinct of the robber ant arose that of the slave-making ant. Slave-making ants, which are lighter in color than their captives, go forth in armies, attack the nests of the black ants, and carry away the larvæ and pupæ. These are brought up and act as servants or slaves. In some cases the warriors are structurally unable to take food, and hence are wholly dependent on their faithful domestics, who collect the food and actually put it in the mouths of their captors. Other small ants (*Solenopses*) live the lives of thieves, secreted in small chambers excavated in the interspaces between the chambers of large ants. The small entrances to the small chambers will not admit the large ants. Hence the small thieves retreat in safety to their homes with the young of the large ant, which they take for food. With the *Formica rufa* a smaller ant lives, apparently, in perfect harmony, perhaps as a domestic pet. When the *Formicæ* are obliged to move, the small forms go too, tapping antennæ with them, or even riding on the backs of their hosts. Many species of beetles, and other little creatures, are usually present in ants' nests, and seemingly on terms of friendship.

Intelligence of Ants. Ants are sensitive to sound waves, even outside of human range; they are also keenly sensitive to changes in moisture and temperature. When a captive colony was placed by an experimenter near the fire, the heat was so grateful to its members, says he, that "they embraced each other, and skipped and danced like playful lambs or kittens." Many cases of ants indulging in what seems to us to be sportive exercise or play are recorded. Their care for the cleanliness of the growing young and the promptness with which they remove the dead from the nest, show a sanitary instinct. The complete and apparently willing suppression of the individual for the good of the colony almost surpasses man's comprehension of self-abnegation. The law of division of labor rules among ants. Certain groups of individuals perform only certain labors. Labor-saving devices are known to ants, for groups of workers will procure and drop food or building stuffs to waiting companions below and thus save much labor of transportation. They show ingenuity in building bridges, and may even span gaps by means of a rope made up of their own living bodies linked together. Moreover, information seems to be imparted by means of the antennæ, which they cross and rub together. Ants are able to recognize the myriads of members of their own colony, including their slaves, and even those that have been taken away in infancy. These facts and many others convince us that ants in some manner communicate with their companions. Otherwise, how are the discovery and the whereabouts of food too large for removal by one made known to the others; or how are cannibalistic and slave-making wars so managed that

ANT



1. COLONY-NEST OF THE BLACK ANT (*Lasius niger*).
 2. LARVA OF BLACK ANT, front and rear view (enlarged).
 3. WINGED MALE OF BLACK ANT.
 4. FEMALE (QUEEN) OF BLACK ANT

5-6. PUPÆ OF BLACK ANT.
 7. WORKER OF THE SMALLER KIND.
 8. LARGER WORKER OR "SOLDIER."
 9. HONEY ANT, distended with stored honey.
 10. CELLS OF BLACK ANT'S NEST, enlarged; feeding larvæ in upper cell.

the whole fighting community is ready to go out simultaneously?

Geological Antiquity. Geologically, ants are among the earliest Hymenoptera. In Tertiary times they were, perhaps, the most abundant of all the insects, and thousands of ancient forms have been found in amber.

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ANTACIDS, *ant-ās'idz* (*ant* or *anti* + *acid*), or **ALKALIES**. Drugs which diminish or correct abnormal acidity in the digestive tract or the various secretions of other organs. Those which unite directly with free acid in the stomach or intestines are known as direct antacids. Examples of this class are ammonia and its carbonate, magnesia, potassium bicarbonate, lime water, and chalk. Remote antacids, such as the acetates, citrates, and tartrates of the alkalies, act by being changed into carbonates, and thus increasing the alkalinity of the blood, which in turn diminishes the acidity of the urine. Some drugs, as the carbonates or bicarbonates of sodium, potassium, calcium, magnesium, and lithium, act as direct as well as remote antacids. The direct antacids are given after meals to neutralize an excess of the natural hydrochloric acid of the stomach and other acids resulting from fermentation of food. Given before meals, they cause an increase of the acidity of the stomach contents by increasing the secretion of gastric juice. The remote antacids are largely employed in the treatment of rheumatism and gout.

ANTÆ. See PILASTER.

ANTÆOPOLIS. See ANTÆUS.

ANTÆ'US (Gk. *Ἀνταῖος*, *Antaios*). A figure in legends of the Greek colonies in Africa, located at first near Cyrene, finally in Mauretania. His story is unknown to Greek epic poetry and is largely made up of borrowings from earlier legends. In the popular version he was a giant, son of Poseidon and Ge, who compelled all strangers to wrestle; he is thus the native opponent of the Greek colonists. When he was thrown, he received fresh strength from touching his mother, Earth. With the skulls of those he conquered, he built a temple to his father. He was invincible until Hercules discovered the source of his power and killed him by lifting him into the air away from the earth and strangling him; in this conquest the Greeks, as early as Pindar's time, saw the triumph of the intellectual, well-trained Greek athlete over the crude native might of the barbarians. Later Greek writers attempted to localize the myth in a city of Upper Egypt called Antæopolis (Egyptian name, *Du-kau*; Coptic, *Tkan*).

ANTAG'ONISM. The power of one solute

to protect an organism against the toxic action of another solute. See NUTRITION.

ANTAKIYEH, *än'tä-kē'yä*. See ANTIOCH.

ANTAL'CIDAS (Gk. *Ἀνταλκίδας*, *Antalkidas*). A Spartan statesman, son of Leon. Toward the end of the year 393 B.C. he was sent by his government to Tiribazus, the Persian satrap at Sardis, to break up the understanding which then existed between Athens and Persia. He succeeded with Tiribazus by agreeing to the Persian demand that Sparta should recognize the Persian supremacy over the Grecian cities in Asia Minor; Tiribazus gave him money to carry on war with Athens. This arrangement did not meet with the approval of King Artaxerxes, to whom the Athenians had sent a counter embassy, under Conon, and the satrap was recalled. However, in 388 B.C., the King restored Tiribazus and thereby gave evidence of his inclination toward the Spartans. Antalcidas was once more sent to Asia to treat with the Persians. He accompanied the satrap to the Persian court, was well received, and succeeded in coming to an understanding with the King on the basis of the terms previously agreed upon, and thus secured his aid against the Athenians. Antalcidas returned to the fleet, of which he was now made admiral, freed it from the blockade of the Athenians, and shut out the Athenians in their turn from the Ægean Sea. He was now in a position to compel the acceptance of terms. The peace that followed was called "The Peace of Antalcidas." In the winter of 387-386 B.C. representatives of the Greek states assembled at Sardis, where the terms of the peace were read. The final ratification took place at Sparta in 386 B.C. The terms of the peace were as follows: 1. That all the Greek towns on the mainland of Asia Minor, together with the islands Clazomenæ and Cyprus, should remain under the protection of the Persian King. 2. That all other Greek towns, large and small, should be independent; but that the islands of Lemnos, Imbros, and Scyros should, as of old, belong to Athens. 3. That war should be declared against any State that refused to accept these terms. In 372 B.C. Antalcidas went for the third time to treat with the Persians, but, after the battle of Leuctra (371 B.C.), he lost favor in that quarter. In 370-369 B.C. we find Antalcidas Ephor at Sparta. There is no truth in the story that he starved himself to death.

ANT'ANACLA'SIS (Gk. *ἀντί*, *anti*, against + *ἀνακλᾶν*, *anaklan*, to bend back). In rhetoric, a figure in which a word is repeated in a sense different from, if not contrary to, its first use, to give additional force to the expression; as the remark of Benjamin Franklin when he was about to sign the declaration of American independence: "We must all hang together or we shall assuredly all hang separately."

ANTANANARIVO, *än'tä-nä'nä-rē'vö*, or **TANANARIVO**. The capital of the island of Madagascar, favorably situated in the central part at an elevation of over 4000 feet (Map: Africa, J 6). It was originally built chiefly of wood, with irregular streets, but stone and brick buildings have superseded the old structures, and there are many excellent edifices, among which are a great number of churches, two cathedrals, a mosque, several colleges and hospitals, the most prominent building being the royal palace, situated on the summit of a hill. Its commerce, owing to its inland position and the inadequate transporta-

tion facilities, is not very extensive, but it has a considerable number of industrial establishments. The natives show in their manners, as well as in their mode of life, the influence of European civilization. Pop., 1904, 59,551; 1912, 94,813.

ANTAR, än'tär, or **ANTARA**, än'tä-rä, **IBN SHADDAD AL-ABSI**. A celebrated Arabian hero living toward the end of the sixth century and one of the famous pre-Islamic poets of Arabia. His mother was a black slave, Seliba, and as the son of a slave he was obliged to render menial services to the members of his tribe. Through his warlike exploits, however, he secured not only his freedom, but a prominent position in his tribe. He died as a hero in battle. While neither the date of his birth nor of his death is known, he appears to have died shortly before the appearance of Mohammed. He gained equal fame among the Arabs as a poet and as a hero. Only one complete poem of Antar's has come down to us, which recounts his deeds and sings of his love for Abla, whom he married. This poem is generally included in the collection of the choicest seven Arabic poems, known as the *Moallakat*. A recent edition of the Arabic text is by L. Abel, *Wörterverzeichnisse zur altarabischen Poesie I* (Berlin, 1891); an English translation by Johnson in *Seven Arabic Poems* (London, 1897). Such was Antar's renown as a warrior that he becomes the prototype of the hero in the romantic literature of the Arabs. He is the central figure in the most famous of Arab romances, which bears the name *Antar* and is commonly ascribed to Al-Asma'i, who lived in the eighth century. The romance of *Antar*, however, as known to us, is a compilation which has passed through various hands and has gradually grown to huge proportions. It gives an attractive and faithful picture of Bedouin life and is rich in epic interest, although too monotonous to satisfy the taste of the European reader. A translation of a portion of it into English was made by Hamilton in 1820 (*Antar: A Bedouin Romance*, 4 vols., London). A *Divān*, or collection of poems, is also attributed to him. They consist for the most part of fragments and have been published by Ahlwardt, *The Divāns of the Six ancient Arabic poets*, 1870, having formed a part of the collection of Al-Alam. The memory of Antar is also preserved in various places of the East which bear his name. Consult Thorbecke, *Antarah, ein vorislamischer Dichter* (Leipzig, 1867); Ahlwardt, *Bemerkungen über die Aechtheit der alten arabischen Gedichte* (1872); Nöldeke, *Fünf Mo'allakat* (1900); Kennedy, *Pre-Islamic Poets* (London, 1908).

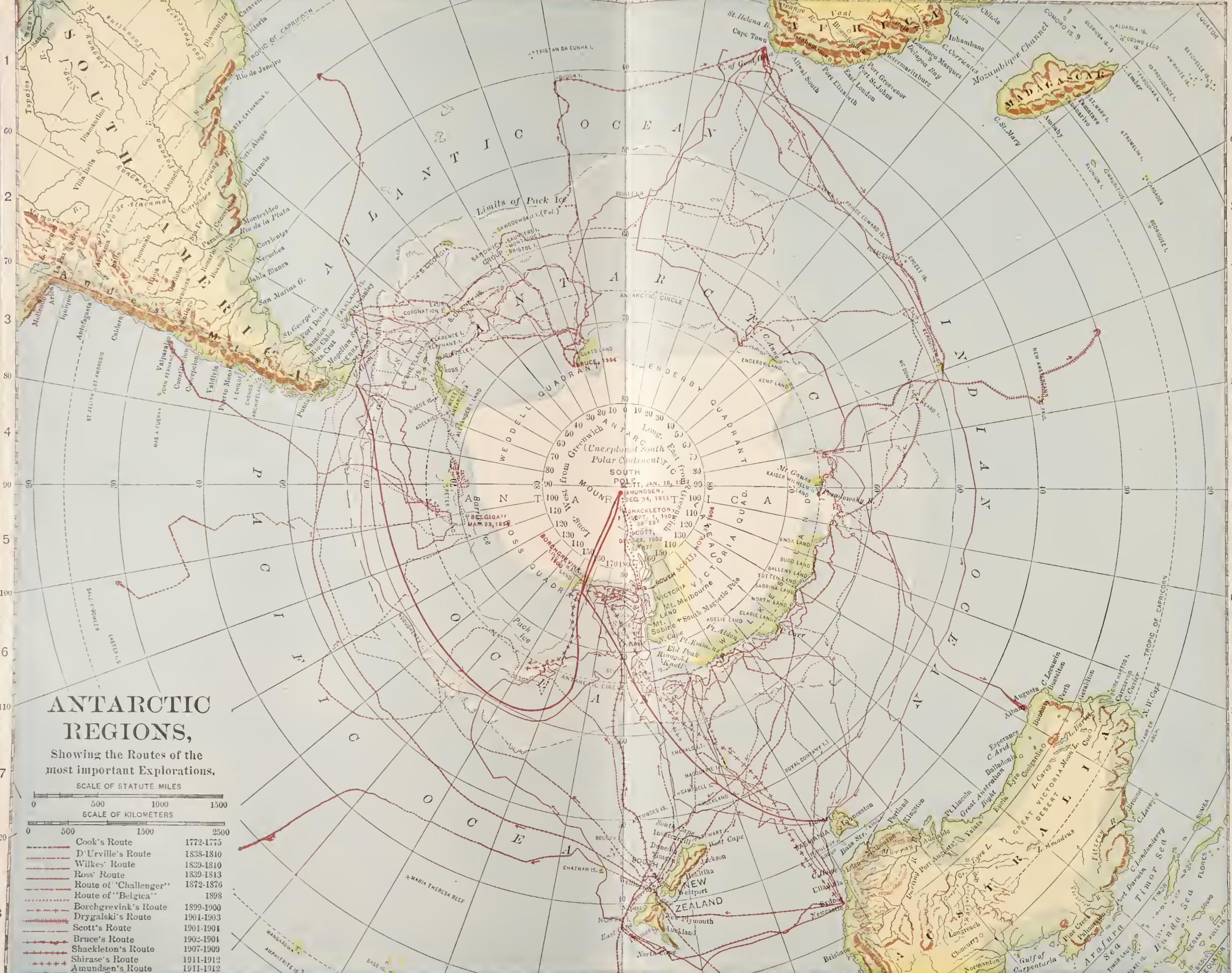
ANTARCTIC CURRENT, LANDS; OCEAN.
See ANTARCTIC REGION.

ANTARCTIC REGION (Gk. ἀντί, *anti*, against, opposite + ἄρκτος, *arktos*, bear, Ursa Major, the north). The name applied to that portion of our earth's surface which encircles the South Pole. Technically and astronomically it is bounded by the Antarctic Circle, and although the Antarctic land masses do not extend much farther equatorward than this, yet the Antarctic influences extend to very much lower latitudes, the solid ice fields drifting on nearly all sides below lat. 60° S., and between the southern extremities of Africa and South America even below lat. 50° S. The limit of this drift ice may be taken as the limit of the Antarctic region, although the drifting icebergs

descend more than 10° of latitude lower. Thus, the Antarctic region is bounded by the Atlantic, Pacific, and Indian oceans. The Antarctic land mass lies, however, mainly within the Antarctic Circle. It is indicated, in the Eastern hemisphere, by a series of minor coast-lines which, roughly speaking, outline the circle between long. c.155° E. and long. c.50° E. Their names are, Adelie Land (c.140° E.), Clarie Land (c.134° E.), Sabrina Land (c.122° E.), Knox Land (c.105° E.), known collectively as Wilkes Land, Kaiser Wilhelm II Land (c.90° E.), Kemp Land (c.60° E.), Enderby Land (c.50° E.). In the Western hemisphere West Antarctica (Graham Land), a long spur, with numerous outlying islands, projects northeastward, from the 70th to 55th degrees of W. longitude, to beyond the 63d parallel of latitude; and near the 156th meridian, W., at the 77th parallel there is another land of unknown extent, called after King Edward VII. Since the recent expeditions of Amundsen and Scott it seems probable that this whole area is a continental land mass, restricted—possibly to separation—by the deep indentations of Ross and Weddell Seas. The former extends to at least 85° S. in 162° W.; the latter to at least 79° S. in 40° W. The remoteness of the Antarctic has prevented its exploration to the same extent as the north polar regions. Cooke (1773-76), Bellingshausen (1821), Weddell (1823), Ross (1842), Wilkes (1840), d'Urville (1840), the *Challenger* expedition (1874), de Gerlache (1897-98), Borchgrevinck (1899-1900), Nordenskjöld (1902-04), Drygalski (1902-03), Scott (1902-04), Charcot (1903-05), Shackleton (1909), Charcot (1910), Amundsen (1911), Scott (1912), Filchner (1912), Mawson (1912), have been the chief explorers of this region. Ross reached a latitude of about 78° 10' S. in 1842, and Scott, in 1902, pushed on to 82° 16' 33" S. The pole itself was finally reached on Dec. 16, 1911, by Amundsen, succeeded within five weeks by Scott, who reached it on Jan. 18, 1912.

Antarctic Lands. The islands and the continent, or continental land-masses, surrounding the South Pole. Little is known of this territory. The continental land-mass where best known, from the northern edge of South Victoria Land in 70° S. to the South Pole, is an elevated ice mantle plateau of an average height of 7000 to 10,000 feet; the pole itself lying at an altitude of 10,200 feet. Superficially all the territories have features in common—more or less lofty coast-lines (with lower islands outlying) covered heavily with snow, often to the water's edge. In many regions barriers or "terraces" of ice, sometimes 200 feet and more above the sea level, border the land for many miles. Behind the sea cliffs, in all the regions that have been visited, there is a more or less level expanse of snow. The outlying islands are mainly of recent volcanic formation; but in those parts of the mainland which have been visited are found granites, fossiliferous sandstones, and other rocks that are characteristic of continental forms. Of the three regions which have been studied, the largest is South Victoria Land, the known coast of which extends between the 160th and 170th meridians E., from about lat. 70° to beyond lat. 83°. Its sea wall of sandstone and granite, containing also carboniferous deposits, is nowhere less than 4000 feet high, and behind it stretches a range of mountains, with peaks ris-

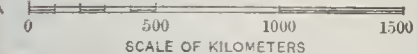
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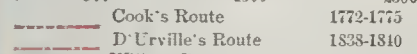
ANTARCTIC REGIONS,

Showing the Routes of the most important Explorations.

SCALE OF STATUTE MILES



SCALE OF KILOMETERS



- | | | | |
|---|-----|-----------------------|-----------|
| 8 | --- | Cook's Route | 1772-1775 |
| | --- | D'Urville's Route | 1828-1840 |
| | --- | Wilkes' Route | 1839-1840 |
| | --- | Ross' Route | 1839-1843 |
| | --- | Route of "Challenger" | 1872-1876 |
| | --- | Route of "Belgica" | 1898 |
| | --- | Borchgrevink's Route | 1899-1900 |
| | --- | Drygalski's Route | 1901-1903 |
| | --- | Scott's Route | 1901-1904 |
| | --- | Bruce's Route | 1902-1904 |
| | --- | Shackleton's Route | 1907-1909 |
| | --- | Shirase's Route | 1911-1912 |
| | --- | Amundsen's Route | 1911-1912 |
| | --- | Scott's Route | 1911-1913 |

130 A 110 B 150 C 160 D Long. 170 West E 180 F Long. 170 East G from 160 Green. H 150 J 110 K 130

ing to the height of 15,000 feet, and continuing southward in Queen Maud's Range, discovered by Amundsen, to at least 88° S. and 100° W. Several of these peaks are extinct volcanoes, and one, Mount Erebus (12,780 ft.), composing with Mount Terror, Ross Island (c. lat. 77° 30'), is still active. The persistence of the range, with its high altitudes (Mount Markham in South Victoria Land and Mount Fridtjof Nansen in the Queen Maud Range, both 15,000 feet) and its general trend, has suggested the possibility of its forming a part of the same mountain axis to which West Antarctica belongs. In Victoria Land lies the south magnetic pole.

From Ross Island to King Edward VII Land, 400 miles, extends the façade of a mass of ice, rising almost uniformly from 200 to 300 feet above the sea. It was discovered by Ross in 1842 and called the Great Ice Barrier. As shown by Amundsen it extends nearly to 86° S. at 160° W. Its eastern limit may lie in this longitude. It completely fills the head of the Ross Sea embayment as far north as the 79th parallel. It is probably the product of the great Antarctic ice sheet. A similar ice barrier exists at the head of the Weddell Sea. The coast of portions of West Antarctica (Graham Land) are also lofty, and here, too, are found ancient crystalline rocks and, on neighboring islands, sandstones rich in fossils. The interior, as seen from the sea, is apparently an "ice-cap" similar to that of Greenland. The third known territory, Kaiser Wilhelm II Land, consists of a completely snow-covered region, with one denuded peak, the Gaussberg (4000 feet). The structure of the land is of ancient crystalline rock. Behind the Gaussberg extends a relatively level ice-plain. In the vicinity of all these lands there is a sudden rise of the sea bottom to the "continental shelf." Upon this fact the advocates of the continent theory base an argument.

Ice. The pack ice is not so formidable as it is in the Arctic regions. The sea freezes over in winter; but ordinarily, in summer, the ice breaks away from the land, and the major part of it is borne away by the prevailing winds. An outlying pack borders all regions that have been reached by explorers; but not being confined by land, as is the ice of the Arctic basin, it becomes dissipated as the season wears on, and is at no time so heavy as the northern pack.

The icebergs are probably not directly formed from glaciers, as in Greenland; the Antarctic glaciers, although of great extent, are at best very sluggish, and the larger number are receding. The bergs undoubtedly are discharged from the great ice barriers or terraces; they are "tabular" in form and often many square miles in area.

Climate. The temperatures of the Antarctic are colder in summer, and perhaps warmer in winter, than those of the far north. The coldest temperature registered upon the *Discovery* expedition was -67° F. (May, 1903). In all regions, both winter and summer, sudden storms, accompanied by blinding snow, are frequent.

Flora. The vegetation is very sparse, consisting of tussock grass, mosses, and lichens. Of these, however, there are a number of species. Three kinds of hepaticæ have also been found.

Fauna. No land mammals exist. A variety of birds build their nests on the beaches. Among the birds are penguins, skua, petrel, ful-

mar, etc. There are five varieties of seal, and upon the northern coasts sea-elephants and sea-lions are sometimes found. There are six varieties of whales and dolphins. Sea life is exceedingly rich, including, among many other species, sponges, medusæ, echinoderms, crinoids, mollusks, nunatodes, amphipoda, cephalopods, etc. Fishes also are abundant.

Antarctic Ocean. The name Antarctic Ocean has been applied to the waters surrounding the Antarctic land-masses, but, according to modern oceanographical research, it is preferable to consider these waters as forming the southern ends of the Atlantic, Pacific, and Indian oceans, the dividing lines between which would respectively be the meridians of Cape Horn (68° W.), South Cape, Tasmania (146.5° E.), and Cape Agulhas (20° E.). Between the southern ends of the continent and the Antarctic lands the whole circumference of the globe presents an unbroken expanse of waters, save for a few islands here and there, being narrowest (600 miles) between South America and West Antarctica and broadest (at least 2400 miles) between Africa and whatever Antarctic land may lie in 20° E. The floor of Antarctic waters rises abruptly, as stated above, to the edge of the continental land-masses. The floor of the Antarctic gradually shoals from the middle latitude depths toward the South Pole. In general, at lat. 60° S., the waters of the Antarctic Ocean have an average annual temperature at the surface of 29.8° F., which is warmer than the average temperature of the air in the same latitude 28.7° F. At great depths and near the ocean floor the water temperature is between 32° F. and 35° F., but between these depths and the surface there is usually found a wedge-shaped layer of water with a temperature varying from 28° F. to 32° F.

The Antarctic drift is mainly from the west on the outer border and from the southwest and south at the interior of the Antarctic region. There are two great Antarctic currents: one crosses the Antarctic Circle toward the north, between long. 120° and long. 140° W., but swerves toward the east in lat. 50°, and near the South American continent separates, part going northward past Peru, and part preserving its eastward movement past Cape Horn, whence it returns to the Antarctic between long. 60° E. and 80° E.; the other current crosses the Antarctic Circle, going north between long. 80° and long. 100° E., and swerves to the eastward, forming the west Australian current.

The winds at the interior of the Antarctic region are probably directed spirally outward from the polar centre, so that they blow as southeast winds; but on the outer border winds are generally from the west, perhaps mostly from the northwest, rather than from the southwest. The annual precipitation immediately around the South Pole is probably less than 10 inches, but this increases to about 25 inches on the outer boundary of the Antarctic continental lands, from whence there is probably a poleward decrease.

Bibliography. Murray, "Antarctic Research," *Geographical Journal*, vol. iii (London, 1894), modified, however, by several articles in the *Geographical Journal* for 1904 and 1905; Cook, *Through the First Antarctic Night* (New York, 1900); Von Drygalski, *Zum Kontinent des eisigen Südens* (Berlin, 1904); Nordenskjöld

and Andersson, *Antarctica* (New York, 1905); Scott, *Voyage of the Discovery* (New York, 1906); Shackleton, *The Heart of the Antarctic* (2 vols., 1909); Charcot, *Le "Pourquoi Pas?" dans l'Antarctique* (Paris, 1910; Eng. ed., London and New York, 1911); Amundsen, *The South Pole* (1913); *Scott's Last Expedition*, edited by Leonard Huxley (2 vols., New York, 1913). See POLAR RESEARCH, paragraph on *Antarctic Explorations*.

ANTARES, ān-tā'rēz (Gk. 'Αντάρης, *Antarēs*, like Ares, or Mars; from ἀντί, *anti*, against, opposite, compared with + Ἄρης, *Arēs*, Mars). A red star, thought by the ancients to resemble Mars (q.v.). It is a double star, the most conspicuous in the constellation Scorpio, and sometimes called, from its position, *Cor Scorpionis*, or the Scorpion's Heart. It gives its name to the third type in Secchi's classification of stars based on their spectroscopic behavior. The spectra of the stars of this type are characterized by heavy absorption bands or flutings which are quite sharply defined toward the violet and shade off gradually toward the red. It is supposed that the flutings are due in large measure to the presence of titanium. Other conspicuous Antarian stars are Betelgeux in the constellation of Orion, and Mira in the constellation of the Whale. Antares is often of use to navigators in determining longitude.

ANT'-BEAR'. The great ant-eater (q.v.).

ANT-BIRD, **ANT-SHRIKE**, **ANT-THRUSH**, and **ANT-WREN**. Names applied to groups within the large South American family of non-oscine Passeres named Formicariidæ, so called because they are supposed to subsist largely upon ants. More than 250 species are known. They are small or medium-sized, long-billed birds clad in soft grays and browns, inconspicuous in appearance and retiring in habit. Their notes are uttered at rare intervals and are ventriloquial in character although often loud and melodious in spite of their generalized oscine or "singing" organs. They creep silently among the lower branches or search on the ground for their insect food. They are almost always found in flocks attendant upon the swarms of hunting or army ants; yet in spite of the wide-spread belief which has given them their name, they seldom feed upon the ants themselves, but on other larger, more edible insects stirred up by the ferocious ants. The low twittering of ant-birds is always a warning of the approach of an army of ecitons or other ants. Like many other large families of tropical birds, ant-birds have been compelled by competition to specialize, and some have become shrike-like in habits as well as appearance; others resemble the long-legged pittas, while many others parallel wrens, warblers, and thrushes. The so-called ant-shrikes or bush-shrikes constitute in particular the sub-family *Thamnophilinæ*, which are found in the Antilles as well as in northern South America; ant-wrens are prettily marked, small, active, wren-like members of the sub-family *Formicivorinæ*; while the ant-thrushes belong to the typical sub-family *Formicariinæ*, to a Guiana species of which, the woodcock-colored ant-thrush (*Rhopoterpe torquata*), Buffon first gave the name *fourmilier* (ant-eater). The term "ant-thrush" is also improperly applied to the pittas, brilliantly colored, ground-haunting, insect-eating birds of eastern Asia and the Malay Archipelago. See PITTA.

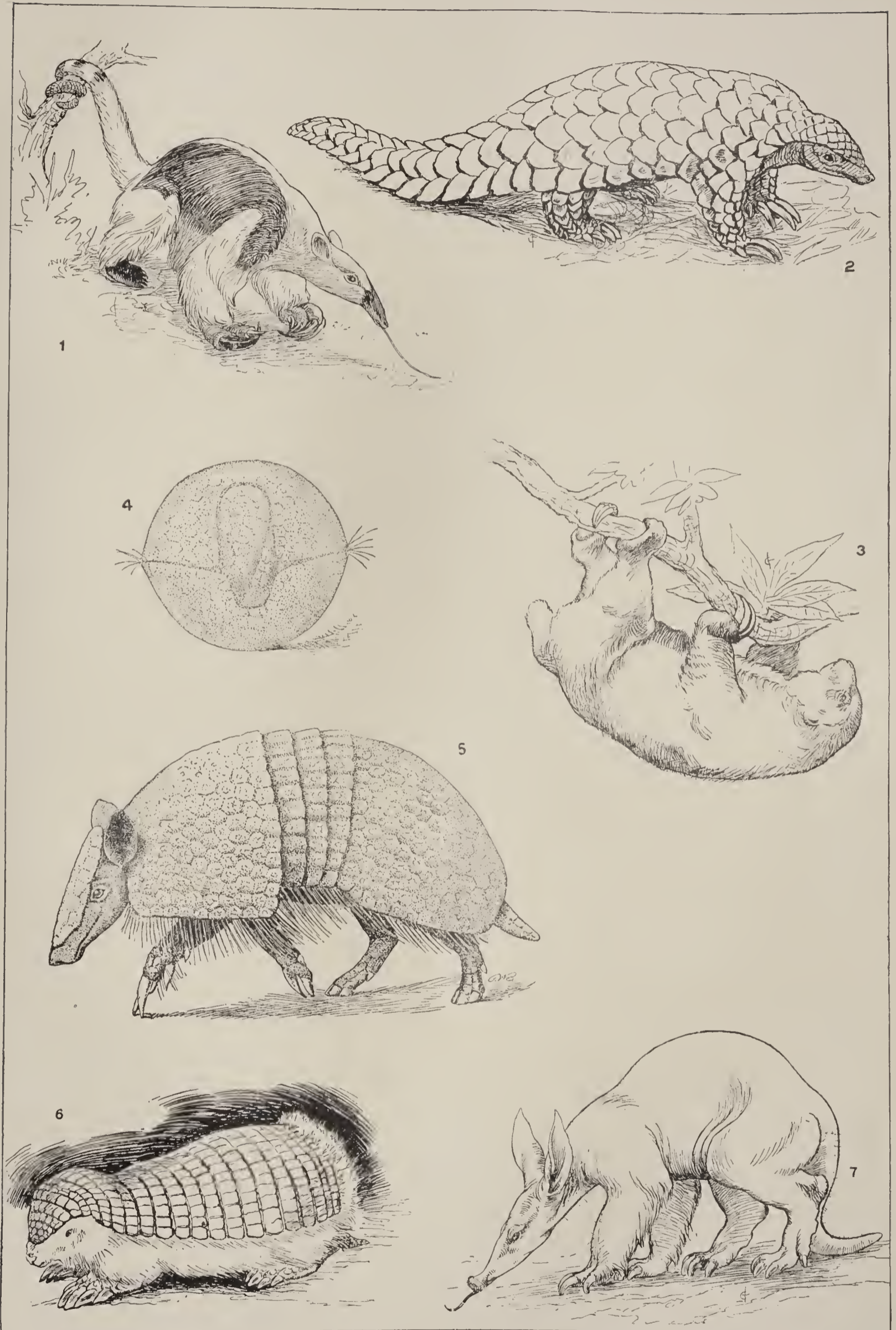
ANT'-EATER. Any of various ant-eating mammals, especially those of the South American Edentate family Myrmecophagidæ. The head in this family is remarkably elongated, with a slender, tubular muzzle, and a small, toothless mouth, with a long, vermiform, protrusile tongue. The eyes and ears are very small. The legs are massive, and the toes united as far as the base of the claws, which are very large and strong and are turned under the fore-feet as the animal walks. The great ant-eater, tamanoir, or ant-bear (*Myrmecophaga jubata*), a native of the tropical forests of South America, is about 2 feet high and 4 feet long without the tail, which is 2½ feet long. The compressed body is covered with long hair, gray, strikingly marked by a black breast-band, which narrows back to the top of the shoulders, while the fore-legs and feet are white. The hair is especially long upon the back and tail, which can be curled over the back and is said to be held there as a shield during rain. The animal dwells in the dense forest, but is wholly terrestrial and does not burrow. It is timid, slow, and inoffensive, but at bay is able to defend itself effectively by means of its long fore-claws, with which it hugs and tears its enemy. These powerful claws are of service in tearing down the hills of the termites and ants, upon which it principally subsists. These are taken by means of the long tongue, which is covered with a sticky secretion from great salivary glands: this tongue is thrust among the disturbed ants or laid in their path and, when a number have adhered to it, is drawn into the mouth.

Only one young one is said to be produced annually, so that the creature is nowhere numerous; nor is this to be regretted, for it has few, if any, qualities to recommend it to man's attention. Another species, the tamandua (*Tamandua tetradactyla*), is much smaller, has a shorter head and short, bristly hair, and a slender, prehensile tail; its body is black, while the head, neck, fore-limbs, and hind-quarters are yellowish-white—a strange dress, varying a good deal among individuals. It also dwells in the equatorial forest of America, but is wholly arboreal, seeking its insect food and making its home in trees. A third species, the little, or two-toed, ant-eater (*Cycloturus didactylus*), is not larger than a rat, is clothed in silky fur, and dwells altogether in trees, for which its long, prehensile tail and curious feet have become especially modified; another species inhabits Costa Rica. For portraits of the three species mentioned above, see Plate of ANT-EATERS.

Other animals called ant-eaters are: 1. The manids, or scaly ant-eaters. (See MANIS.) 2. The aard-vark (q.v.). 3. The porcupine ant-eaters, or Echidnæ. (See ECHIDNA.) 4. The Australian insectivorous marsupials of the genus *Myrmecobius*, as *Myrmecobius fasciatus*, of West Australia, about as large as a squirrel, chestnut red, with white and dark stripes on the back. It has a long slender tongue, like a true ant-eater, but it has more than 50 teeth, a greater number than any other living mammal. It scratches open ant-hills for its food. (See Plate of PHALANGERS.) 5. Any of various ant-eating birds.

ANTECHAPEL. (Arch.) A chapel in front of a church, forming a part of the same structure. In some cases the antechapel serves both as a chapel and as a porch of entrance, as

ANT-EATERS AND ARMADILLOS



1. LESSER ANT-EATER (*Tamandua tetradactyla*).
 2. SCALY ANT-EATER OR PANGOLIN (*Manis javanicus*).
 3. THREE-TOED SLOTH (*Bradypus tridactylus*).

4-5. THREE-BANDED ARMADILLO (*Tolypeutes tricinctus*); rolled up and walking.
 6. PICHICIAGO (*Chlamydophorus truncatus*).
 7. AARD-VARK (*Orycteropus capensis*).

at the abbey of Vézelay in Burgundy and the church of St. Front at Périgueux (twelfth century); in some it takes the place, but not the function, of a porch, as the Galilee Chapel of Durham Cathedral, England; or again it may project from the West front of the church without interfering with the central door or porch, as in the Broadway Tabernacle, New York City.

ANTECHOIR. See CHOIR.

AN'TEDILU'VIAN (Lat. *ante*, before + *diluvium*, flood). A word used to denote whatever existed before the Flood. The antediluvian ages are those which elapsed before the Flood; and in theological language the antediluvian religion means the religion of the patriarchs from Adam to Noah. In geology the antediluvian period had no reference to the Deluge recorded in the Mosaic narrative, but signified only the final transformation of the earth by means of water. The term is not in good use at the present time, except as an adjective of exaggeration to denote extreme antiquity.

AN'TEDON. See CRINOIDEA.

AN'TEFIX (Lat. neut. pl. *antefixa*, from *ante*, before + *fixus*, fastened, fixed). An ornament, usually of terra cotta or marble, repeated along the edge of the roof of a classic building at the foot of each of the ridges covering the joints of the flat tiles of the roof. The antefix



ANTEFIX.

was commonly decorated with an anthemion, painted or carved; sometimes, however, especially in Etruscan examples in terra cotta, a head or even a whole figure in relief formed the chief decoration. The antefix was less used in Roman architecture than in the Greek and Etruscan, and wholly passed out of use with the decline of the Roman Empire.

ANTEIA. See BELLEROPHON.

ANTELAMI, ä'n'tä-lä'më, **BENEDETTO** (active 1177-1233). The most prominent sculptor of the Romanesque epoch in Italy. His sculpture is decorative in character and is conceived in the solemn and grandiose spirit of Lombard architecture. His earliest known work is a "Descent from the Cross" in the cathedral of Parma (1178). In the cathedral of Borgo San Donino (1178-96), the statues as well as the reliefs of the façade were executed under his supervision, and, in the interior, the imposing statue of "Christ Blessing" is by his own hand. His masterpiece was the cathedral of Parma, begun 1196, in which he served both as architect and master sculptor. The numerous sculptures of the façade, depicting the truths of the Christian faith, the fine lunettes of the interior, and the holy-water font were carved by him or under his direction. He also carved the bishop's

chair of the cathedral of Parma and labored upon the portals of Sant' Andrea in Vercelli and also in Milan. Consult Venturi, *Storia dell' arte italiana* (1907).

AN'TELOPE (Gk. *ἀνθόλοψ*, *antholops*, a horned animal). Any of many hollow-horned ruminants forming a group (formerly esteemed the family Antilopidæ) within the family Bovidæ, and usually classified between the cattle and goats. The English word, in its widest popular use, often includes on the one hand a group represented by the chamois and the Rocky Mountain goat, preferably designated goat-antelopes; and on the other the American antelope or pronghorn (q.v.), which belongs to a quite different family. Scientifically, as now restricted by R. Lydekker and recent students, the term excludes these forms. The group cannot be demarked from other bovines by definite characters, yet as a whole it is easily recognized by the graceful build of its members (exhibited in the accompanying illustrations), their short hair, lively colors, manner of carrying the head uplifted, and the absence of a goat-like beard. "The horns, which may or may not be present in the females, are generally long, more or less cylindrical, and often lyrate in shape; while they are frequently marked with prominent rings and have an upright direction. Their bony internal cores, instead of being honey-combed, as in the oxen, sheep, and goats, are nearly solid throughout. These animals generally have a gland beneath the eye, by which they are distinguished from the oxen and goats" (Lydekker). In size they vary from a foot in height to the bigness of a large horse. Almost all are timid, peaceable animals, with small means of defense, and trusting for safety to the agility and fleetness in which they excel. Most of them inhabit plains, and these are highly gregarious; a few are found only in mountainous regions, while others dwell in pairs or small bands in jungles and deep forests. Palæontologists inform us that antelopes are the most generalized members of the Bovidæ now existing, and "since they are also its oldest known representatives, it is probable that from them have been derived the more specialized types,"—oxen, sheep, goats, etc.

Though now wholly restricted to Asia and Africa, the antelopes had formerly a wide distribution in Europe and Asia alone. Their disappearance from Europe and spread into Africa within recent times (geologically speaking), and their enormous multiplication there, form one of the most remarkable incidents in the history of the mammalia. When South Africa was first penetrated by Europeans, many species were found ranging its grassy plains in enormous herds, which formed the principal resource for animal food of the natives and a great number of carnivorous animals. This continued until the middle of the nineteenth century, when the rapid spread of English and Dutch colonization swept them away. Vast numbers were wasted by sportsmen and reckless colonists, or were killed for the sake of their flesh and hides, until now the great herds have disappeared from the remotest veldts, many species a few years ago numbered by tens of thousands are reduced to scattered bands, and others have become wholly extinct. The wide and rapid destruction of these abundant, valuable, and beautiful animals can be paralleled elsewhere only by the swift extermination of the American bison.

Several species are represented only by small bands preserved upon private estates.

Antelopes fall into certain groups having a common resemblance. These will be outlined here, leaving the reader to consult for details the separate articles upon individual species, the most important of which will be found described in their alphabetical places. One collocation is that of the *antelopine* gazelles, including a large number of species elegantly shaped and colored, as a rule not exceeding 30 inches in height, with hairy muzzles and teeth resembling those of goats, and with ringed and usually lyrate or spiral horns; they inhabit deserts from the Cape of Good Hope to India. Here, among less noteworthy kinds, fall the familiar ariel and other gazelles, the black-buck of India, the saiga, chiru, springbok, impalla, and the like. Another group (*cervicaprine*) is represented by the small African reed-bucks, the larger water-bucks, cobus, etc., the smaller rehboks and klipspringer, and the diminutive steinboks. A third (*cephalopine*) group is composed of the duikerboks and other forest-ranging species of Africa, among which are the smallest known ruminants, the least (see BLUE-BUCK) being only 13 inches tall. Only the males of these are provided with horns, and one species (see CHOUSINGHA) has four horns. These pygmies are connected with the cattle by the *alecephaline* antelopes, all large African species characterized by their much greater height at the withers than at the rump, and by having horns in both sexes, the cores of which are cellular as in oxen; prominent examples are the hartbeests, blesbok, bontebok, and gnus. Diverging oppositely from the typical gazelles toward the goats, the *hippotragine* section has been made to include very large African antelopes having long, stout, ringed horns in both sexes, such as the sable and roan antelopes, the extinct blaubok, addax, gemsbok and allied species. Another set of large species is the *tragelaphine*, represented in India by the nilgai, and in Africa by the bushbuck, koodoo, eland, etc. They are the largest, most valuable, and handsomest of all, their ground colors being bright and often ornamented or "harnessed" with conspicuous stripes, while their faces are beautifully marked. Consult: for former abundance in Africa, Harris, *Game Animals of Africa* (London, 1840), with colored folio plates; Lichtenstein, *Säugethiere und Vögel aus dem Kaffernlande* (Berlin, 1842); and the narratives of Livingstone, Gordon-Cumming, Andersson, Drummond, Baker, Schweinfurth, Selous, and similar explorers and sportsmen. For more modern conditions, Millais, *A Breath from the Veldt* (London, 1895); and Bryden, *Nature and Sport in South Africa* (London, 1897). For Asiatic species, Baker, *Wild Beasts and their Ways* (London, 1890); Blanford, *Fauna of British India: Mammals* (London, 1888). For zoölogy, Selater and Thomas, *The Book of the Antelopes* (London, 1894-1900); Brooke, *Proceedings of the Zoölogical Society of London* (1871-73).

For the so-called antelope of western North America, see PRONGHORN.

AN'TENA'TI (Lat. nom. pl. of *antenatus*, from *ante*, before + *natus*, born). In law and history, persons born before a certain time or event, especially with reference to the existence of rights which are claimed. The term is specifically applied: (a) to children born before

the marriage of their parents. By the common law of England such children are held to be bastards and do not become legitimate upon the subsequent marriage of their parents, whereas in the civil and canon law *antenati* are legitimate and capable of inheriting the real property of the father as if born after marriage. The common law rule prevails in the United States excepting where it has been changed by statute. (See BASTARD; HEIR; LEGITIMACY.) (b) In English history, to those natives of Scotland who were born before the accession of the Scotch King James VI to the throne of England as James I, and whose status as English citizens was therefore disputed. (c) In American history, to Americans born in this country before the Declaration of Independence; and, also, to those citizens of the colony of New York who were born during the period of Dutch sovereignty and who survived the transfer of the territory and government to the English crown. The property rights of the antenati, and, to a certain extent, the benefits of the Dutch law, were expressly preserved to them by the articles of capitulation, 1664. Consult the historical introduction to the Grolier Club's *Faesimile of Bradford's Laws of New York, 1694* (New York, 1894). See ALLEGIANCE; ANNEXATION.

ANTEN'NÆ. See INSECT.

AN'TENNA'TA (Lat. *antenna*, sail-yard, Neo-Lat. a feeler; horn of an insect). A class of Arthropoda characterized by the possession of one pair of preoral feelers, three parts of oral limbs and head distinctly marked off from the trunk; respiration by tubular tracheæ, opening externally by segmentally arranged openings called stigmata. The class is divided into two sub-classes: *Myriapoda*, or centipedes, etc., and *Hexapoda*, or insects (qq.v.).

ANTE'NOR (Gk. Ἀντήνωρ, *Antēnōr*). The wise Trojan who advised his fellow-citizens to send Helen back to her husband. In return for his friendliness to the Greeks, his house was spared during the sack of Troy. A later version represents him as betraying the city. Legends differ about him: one is that he built a city on the site of Troy; others make him the founder of various cities in northern Italy (so Vergil, *Aeneid*, i, 242-249, and Livy, i, 1) or of Cyrene.

ANTENOR (Ἀντήνωρ). An Athenian sculptor of the sixth century B.C. He made the original statues of Harmodius and Aristogiton (q.v.), which were carried to Susa by Xerxes (480 B.C.). After the conquest of Persia they were restored by Alexander the Great, or one of his successors, and were set up again in the *Agora*, where they were placed originally; the original statues were seen at Athens by Pausanias (q.v.). In 478 B.C. the original statues were replaced by others executed by Critius and Nesiotes. The statues of Harmodius and Aristogiton, now in the Museo Nazionale at Naples, are regarded by good authorities as copies of those by Critius and Nesiotes.

AN'TEPEN'DIUM (Lat. *ante*, before + *penderē*, to hang). A hanging in front of the altar. As the earliest Christian altars were usually tables of wood or marble, it was customary during service to hang or set in front of them a richly decorated piece of stuff or metal relief. See ALTAR.

ANTEQUERA, än'tā-kā'rā (anciently *Antiquaria*). An important manufacturing town in the province of Malaga, Spain, situated in a fertile plain at the foot of the Sierra de Antequera,

ANTELOPES

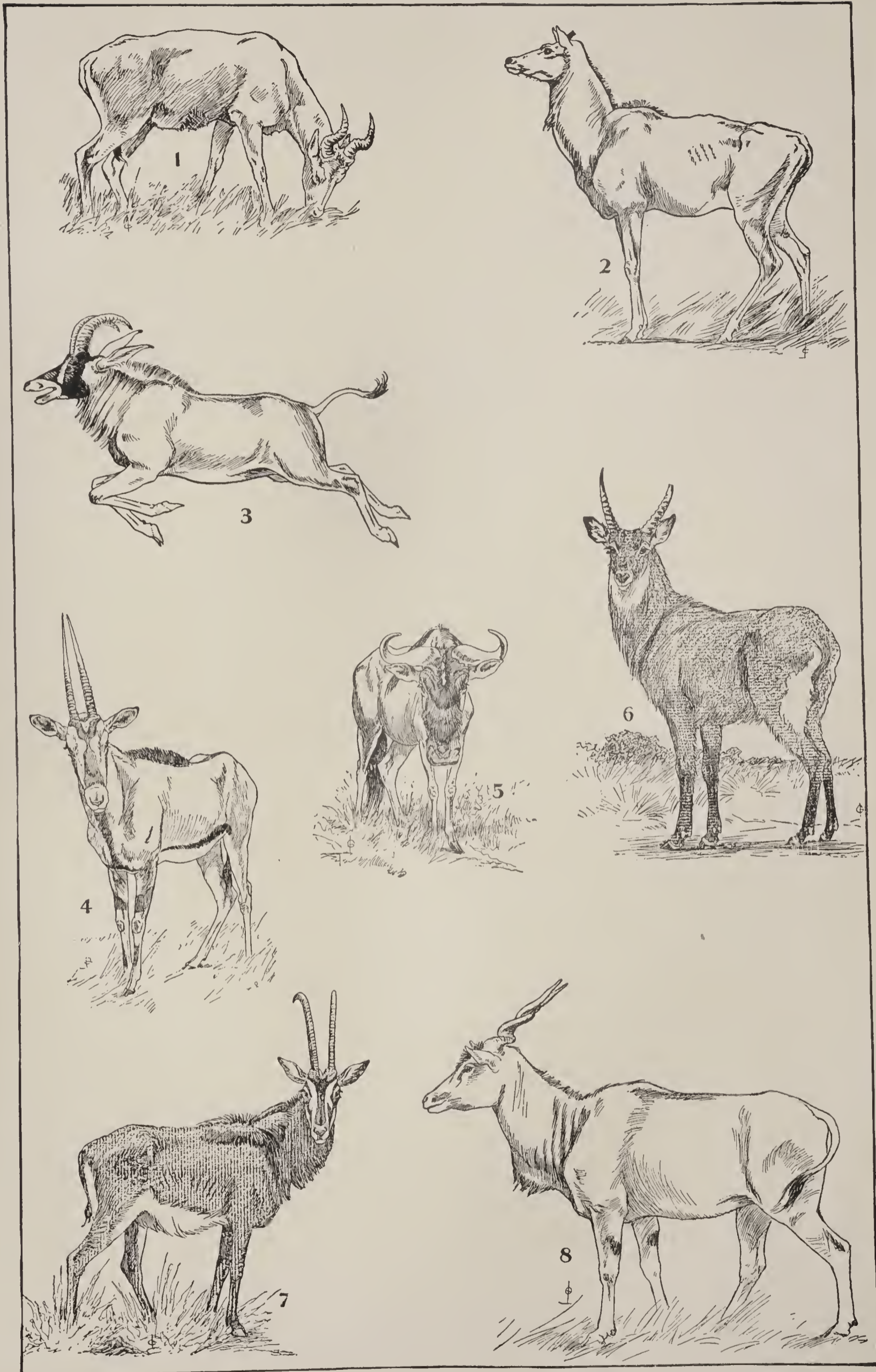


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1 DUIKERBOK - CEPHALOPHUS GRIMMI
2 BUSH BUCK - TRAGELAPHUS SCRIPTUS
3 PRONGHORN - ANTILOCAPRA AMERICANA
4 SAIGA - SAIGA TATARICA
1/10 NATURAL SIZE

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ANTELOPES



1. BUBALINE ANTELOPE (*Bubalis coama*); type of Hartebeests.
 2. NILGAI (*Bosephalus tragocamelus*).
 3. ROAN ANTELOPE (*Hippotragus equinus*).
 4. BEISA (*Oryx gazella*); type of Gemsboks.

5. BRINDLED GNU OR BLUE WILDEBEEST (*Connochaetes taurinus*).
 6. SING-SING (*Cobus defassa*); type of Waterbucks.
 7. SABLE ANTELOPE (*Hippotragus niger*).
 8. ELAND (*Taurotragus oryx*).

on the Guadalhorce, 45 miles west of Granada (Map: Spain, C 4). It has a Moorish castle and is the seat of a number of hidalgos. There are some stately houses, several palaces, and a fine church of the Virgin. It is active in the manufacture of woolen goods, paper, sugar, soap, and silk. There is considerable trade in fruit, oil, and wine. Pop., 1900, 31,665; 1910, 32,366.

AN'TEROS (Gk. Ἀντέρωσ, from ἀντί, *anti*, against + ἔρωσ, *erōs*, love). In the mythology of the Greeks, the brother of Eros, and god of unrequited love.

ANTEROS, or **ANTERUS**. Pope, or rather Bishop of Rome, from Nov. 21, 235, till his death, Jan. 3, 236. He comes in the list of popes between Pontianus and Fabianus.

ANTHE'DON (Gk. Ἀνθηδών). A small town on the north coast of Bœotia, situated at the foot of Mount Messapion, on the strait of Eubœa. It belonged to the Bœotian league; it was destroyed by Sulla, but was later restored. The site, near the modern Lukisi, was described by Leake, *Travels in Northern Greece*, ii. In 1889 excavations were conducted on its site by the American School of Classical Studies at Athens, which brought to light a complex of foundations near the harbor, and what seems to have been a small temple on a hill outside the city. The course of the walls was also traced, and a number of bronze implements and 64 inscriptions were found. The latter are chiefly gravestones, but give some idea of the local alphabet and dialect. Consult *American Journal of Archæology*, vi (1890).

ANTHE'LIA (Gk. ἀντί, *anti*, against + ἥλιος, *hēlios*, the sun). Luminous rings opposite to the sun, seen when the observer looks toward his own shadow cast upon a cloud or bank of fog or on the dewdrops on the grass. The shadow is seen to be encircled by a glory consisting of one or several concentric rings, having their common centre at the anti-solar point. The rings are usually colored, red inside and blue outside, but these are not pure colors, because formed by many overlappings of elementary rings. The outside rings have but little color and fade out into white. The radius of the rings increases with the smallness of the globules that make up the fog or cloud. The largest ring ever observed is the "white rainbow," which has an angular radius of about 40 degrees. It is almost pure white and is generally known by the name of the first observer, as Ulloa's ring. These rings are formed by the interference of rays of sunlight reflected from minute drops very much as in the case of the rings or glories seen close around the sun and moon. All these phenomena were imperfectly explained by Sir Isaac Newton as due to the dispersion of light refracted through drops of fog or rain; the only satisfactory explanation is that first given by Dr. Thomas Young, and more fully developed recently by Dr. Pernter, which attributes them to diffraction or interference. Consult Pernter, *Meteorologische Optik* (Vienna, 1901). See LIGHT.

AN'THELMIN'TIC (Gk. ἀντί, *anti*, against + ἕλμινς, *helmins*, a worm). Any medicine hostile to intestinal parasites. Anthelmintics which destroy are vermicides; those which expel, vermifuges. They act in one of three ways: (1) mechanically; (2) by some intoxicating influence; (3) by an actual poisonous effect. Among the remedies employed for the *Oxyuris vermicularis*, 'seat-worm,' or 'thread-worm,' are

enemata of salt and water, lime water, or of infusion of quassia. For the *Ascaris lumbricoides*, or 'round worm,' santonin (q.v.) and spigelia, or pink-root, are most frequently used. The drugs given to expel tæniæ, or tape-worms, are aspidium, or male fern; pumpkin seeds, and bark of the pomegranate. Kamala (q.v.) is fairly efficient; cusso, or koussou, is of doubtful value. For hookworm (*Necatur americanus*, *Ankylostoma duodenale*) thymol is the most efficient remedy. Vermicides are given after a period of fasting, in order that the worms may not be protected by masses of food, and are followed in three or four hours by a brisk purgative to expel the dead or stupefied parasites. See ASCARIS; WORM.

AN'THEM (ME. *antempne*, earlier *antefne*, ML. *antiphona*, from Gk. ἀντί, *anti*, against + φωνή, *phōnē*, voice, sound). A piece sung in alternate parts. A species of musical composition introduced into the service of the English church after the Reformation, and appointed to be sung daily, at morning and evening service, after the third collect. The words of the anthem are taken from the Psalms, or other suitable parts of the Scriptures, and the music is either for solo or chorus, or a mixture of solo and chorus. It is rendered with or without instrumental accompaniment. In its origin, musical construction, and use the anthem is similar to the motet of the Roman church and the *Kantate* of the Lutheran church. See MOTET; also ANTIPHONY.

AN'THE'MION (Gk. ἀνθέμιον, blossom, flower). A decorative motive of radiating leaves in ancient, Oriental, Greek, and Roman art. Derived originally from the Egyptian



ANTHEMION.

lotus-palmette through Ægean and Assyrian art, it was the most characteristic motive of painted ornament on Greek vases and terra cotta moldings and antefixæ, and was carved on bands and cymas of Ionic and Corinthian buildings and on the heads of funereal stelæ. It was further elaborated by the Romans, revived in the Renaissance, and has been the prolific parent of countless motives in modern art. Consult Owen Jones, *Grammar of Ornament* (London, 1856); Goodyear, *A Grammar of the Lotus* (New York, 1892).

AN'THEMIS. See CHAMOMILE.

ANTHE'MIUS (Gk. Ἀνθέμιος, *Anthemios*) (sixth century A.D.). A Greek architect, mathematician, and engineer; born at Tralles, in Asia Minor. With the assistance of his colleague, Isidore of Miletus, he planned and built for the Emperor Justinian the church of St. Sophia in Constantinople (532-538), one of the greatest buildings in architectural history, and so may

be regarded as the founder of the developed Byzantine style. He wrote, among other mathematical treatises, a work on the subject of burning-glasses. Some fragments of his writings have been found. He continued the Greek tradition of uniting architecture and theoretical mathematics, which the Romans had discouraged, and he was one of the greatest architects of all ages.

ANTHEMIUS. An Emperor of the West (467-472), and son-in-law of the Eastern Emperor Marcian. He was appointed to the Western throne by the Emperor Leo, at the instance of Ricimer, who afterward married Anthemius's daughter. A quarrel arose between them, and Ricimer proclaimed Olybrius Emperor of the West in 472 and marched on Rome, which he took by assault. Anthemius perished in the battle. His character is highly praised in a panegyric of Apollinaris Sidonius (q.v.). Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

AN'THER (Gk. *ἀνθήρως*, *anthēros*, flowery, blooming). That part of a stamen which produces pollen. An anther usually consists of two small sacs, between which there occurs a certain amount of sterile tissue (the "connective"), which is often nothing more than the top of the axis of the stamen. See FLOWER.

AN'THERID'IUM (a diminutive after the GREEK fashion from *anther*; see AN'THER). The male organ of plants; that is, the organ in which the sperms are developed. Among the algæ and fungi an antheridium is usually a single cell, and in the simplest forms in which antheridia appear this single cell is merely a vegetative cell which under certain conditions produces sperms. In most algæ and fungi, however, the antheridium is a distinctly differentiated cell set apart from the very first for the production of sperms. Among the mosses and ferns the antheridium is a many-celled organ of

bursts open in the presence of moisture and discharges its mass of cells and sperms, the latter of which free themselves by their movements and are ready to swim to the female organs. Among the ordinary ferns the antheridia are on the lower surface of the prothallium, being more or less imbedded in its tissue.

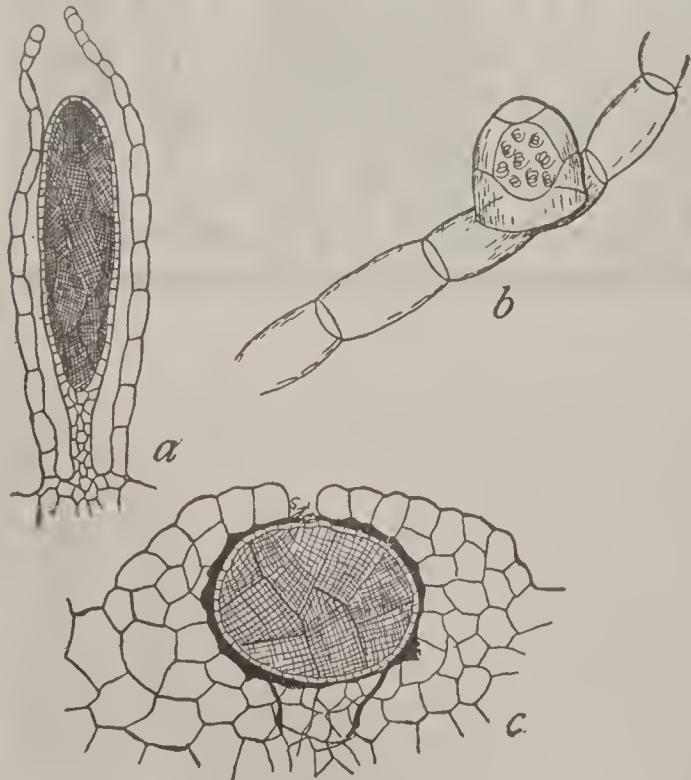
With the introduction of heterospory (q.v.), which involves certain of the fern-plants and all of the seed-plants, the male plant is very much reduced in size, being entirely contained within the spore that produces it, which in the seed-plants is called the pollen grain. This small male plant is in most cases a single antheridium, and in seed-plants the antheridium is represented chiefly by two sperms. In seed-plants, therefore, the antheridium is a concealed organ; while in the lower groups it is a conspicuous organ.

The name is an unfortunate one, since it means "anther-like," having been given under the impression that the anther of seed-plants is a male organ. It would be very desirable to change the name if such a thing were possible, and "spermary" has been proposed as a substitute.

AN'THESTE'RIA. See GREEK FESTIVALS.

ANTHEUNIS, ä'n'tē'nē', GENTIL THEODOOR (1840—). A Flemish poet. He was born at Oudenarde, and removed to Brussels. He is considered one of the best lyric poets of Belgium. His verse is distinguished by depth of sentiment and euphony. Among his most popular songs are *Lentelied*, *Ik ken een Lied*, *Vergeefs*, and *Getrouwe liefde*. Collections of his poems have been published under the titles *Uit het Hart* (1875); *Leven, Lieven, Zingen* (1879).

AN'THOCY'AN, or **ANTHOCYANIN** (Gk. *ἄνθος*, *anthos*, flower + *κύανος*, *kyanos*, a dark-blue substance). The blue, purple, or red pigments found dissolved in the cell sap of flowers, fruits, young leaves and stems, roots, etc. The term "erythrophyll" is still sometimes used in this sense. The chemistry of the anthocyanins is imperfectly known, but the term includes a number of individual compounds closely related to the tannins. There is evidence for the existence of two general groups of the bodies, with rather distinct chemical and physical characters: "beet red," found in all parts of the red beet and in the dark red varieties of *Chenopodiaceæ* and *Amarantaceæ* and other plants; the "vine red," found in wine, autumn leaves of *Ampelopsis*, *Rhus*, *Cornus*, and other plant organs. In an acid medium the anthocyanins take on some shade of red, while in a basic medium they are blue or violet. For this reason the color of the anthocyanin in a plant organ indicates whether the organ is acid or basic. When extracted, some of the anthocyanins form excellent acid and base indicators. The function of anthocyanin in the living plant is not positively known, although numerous attempts have been made to explain its presence and distribution. (See COLOR.) 1. It has been held to be a protection to the green coloring matter of young leaves against too much light, which promotes its decomposition (see CHLOROPHYLL), especially when it is formed slowly on account of low temperature. 2. It has been suggested that it protects the protoplasm against too great intensities of the injurious blue-violet and ultra-violet rays. The absorption spectrum of the anthocyanins does not support either of these views. 3. It is alleged to be of advantage to young leaves and shoots



ANTHERIDIA OF A MOSS.

varying shape. The moss antheridium is a free organ and more or less club-shaped, a section showing that the wall consists of a single layer of sterile cells, and that the rest of the structure is a compact mass of very small cells, within each one of which a single sperm is organized. The antheridium springs open or

by increasing the absorption of the sun's energy, and thus raising their temperature. 4. Many hold that it is a by-product of metabolism that in some cases proves of advantage to the plant, as in the flowers and leaves, while in other cases it is indifferent, as in the roots. While in the main the amount and character of the anthocyan developed is determined by special and varietal qualities, still the amount is often affected by the conditions in which the organ develops. The amount of sugar present is one of the most important conditions. With high sugar content, at least in many plants, there is high tannin and anthocyan content. In turn, high sugar content often goes hand in hand with low temperature. This seems to account for the strong anthocyan development in spring and autumn foliage as well as in alpine and arctic plants.

ANTHOL'OGY (Gk. ἀνθολογία, *anthologia*, a flower-gathering, from ἄνθος, *anthos*, flower + λέγειν, *legein*, to pick out). The title usually given to a book consisting of an unconnected series of choice thoughts, usually of brief compass, whether in prose or in verse, but generally in the latter. In ancient times collections of this kind consisted largely of epigrams. (See EPIGRAM.) Even before Aristotle's day collections had been made of actual inscriptions graven on stone and on votive objects: thus Polemon gathered the Spartan, Philochorus the Attic, Aristodemus the Theban inscriptions. It was an easy step from this to the collection of epigrams that had been published in books: of these there were very many in widely scattered collections, for the most part small. 1. The earliest **Greek Anthology** based on literary pieces was compiled by Meleager, of Gadara, in Syria, about 80 B.C., and was the result of a renewed interest in the older Alexandrian poets. It was named *The Garland* (Στέφανος, *Stephanos*), and contained 130 of Meleager's own epigrams, and selections from 47 other poets, including Alcæus, Alexander Ætolus, Anacreon, Archilochus, Callimachus, Euphorion, Sappho, and Simonides. Something more than 100 years later, Philip of Thessalonica gathered the best epigrams of the preceding century into a collection, which he published in the reign of Caligula, and which at an early date seems to have been combined with Meleager's *Garland*. In both collections the epigrams were arranged according to the initial letters of the first verse. A third collection was made by Straton, of Sardis, in the second century A.D.; and a fourth by Diogenianus Heracleota. The latter seems to have been the first to adopt the name "anthology" (ἀνθολόγιον ἐπιγραμμάτων, *anthologion epigrammatōn*). The writing of epigrams then languished, but it was revived again during the sixth century in Constantinople; and the productions there of Julianus, Christodorus, Leontius, Paulus Silentarius, and others gave occasion for a new anthology, made under Justinian by Agathias of Myrina and called by him *The Cycle* (Κύκλος, *Kyklos*). He was the first, it seems, to arrange his collection according to the themes of the poems. Thus, book vi contained poems of love, book vii poems on the joys of the table and of wine. Within the books the poems of a given author were separated by pieces from an array of other writers. Apparently the combined anthology of Meleager and Philip was current for a long time beside the *Cycle* of Agathias. In the tenth century

small anthologies, the so-called *Sylloge Euphemiana* and the *Sylloge Parisina*, were made; in these two the arrangement was by subjects. Better known and more complete is the large compilation of Constantinus Cephalas in 15 books, which dates from the early part of the same century; here again the arrangement is by subjects, in chapters. Four centuries later, in Constantinople, the monk Maximus Planudes made a careless selection from Cephalas's compilation, in seven books, called ἀνθολογία διαφόρων, ἐπιγραμμάτων, *anthologia diaphorōn epigrammatōn*, *A Collection of Miscellaneous Epigrams*, arranged by subjects, in chapters. This latter was the only anthology known to western Europe until the seventeenth century. It is preserved at Venice in the single manuscript from which it was first published by Lascaris (Florence, 1494). It has been frequently reëdited, and was admirably translated into Latin, in part, by Grotius.

In 1607, however, Salmasius (q.v.) discovered and copied in the Palatine Library at Heidelberg the single manuscript of Cephalas's larger compilation, now known as the *Palatine Anthology*. Salmasius's copy was published first by Brunck in his *Analecta Veterum Poetarum Græcorum* (1776); this edition was superseded by Jacobs's *Anthologia Græca* in 13 volumes (1794-1803; improved edition, 1813-17), and was again reëdited with the addition of epigrams from inscriptions by Dübner, in his *Epigrammatum Anthologia Palatina* (2 vols., 1864, 1872; third volume by Cougny, 1890); Stadtmüller's critical edition of it is not yet completed (vol. i, 1894; ii, 1, 1899). In all, over 300 poets, some of them women, from pre-classical to Byzantine times, are represented in this *Anthology*; the collection is invaluable as a mirror of Greek civilization and thought, and the epigrams express the entire range of human feeling with a brilliancy and cleverness that translation cannot reproduce. Translations have been made into English by Wrangham, John Sterling, Merivale, Garnett, Symonds, and others; into French by Dehesme, into German by Herder and Jacobs. Consult: Wellesley, *Anthologia Polyglotta* (1849); Symonds, *Studies of the Greek Poets* (London, 1893); Butler, *Amaranth and Asphodel* (London, 1881); Mackail, *Select Epigrams* (London, 1906). On the smaller collections, consult Dilthey, *De Epigrammatum Syllogis Quibusdam Minoribus* (1887).

2. **Latin Anthologies.** Among the Romans, the passion for making epitomes, selections, and *florilegia* of all kinds was strongly developed by the first century A.D. (See Nettleship, *Lectures and Essays: First Series*, Oxford, 1885, 248 ff.) Collections of *sententiæ*, or pithy sayings, were early made, for educational purposes. Collections of poems are mentioned in Catullus; book sellers also caused such collections to be made. In 1573 Scaliger published at Leyden, in imitation of the Greek anthology, a Latin anthology, under the title *Catalecta Veterum Poëtarum*, and Pitthöus one at Paris, 1594. A larger collection was issued at Amsterdam (1759 and 1773) by Peter Burmann the younger, under the title *Anthologia Veterum Latinorum Epigrammatum et Poëmatum*; this comprised fugitive Latin verse from the time of Ennius to 100 A.D.; the arrangement was by subjects. In the nineteenth century a more careful anthology was undertaken by Riese (1869-70), a second edition of which has been published (Leipzig,

1906). The arrangement here is according to the sources of the epigrams. The Latin anthologies differ from the Greek in that they are the work of modern scholars who have patiently put together, by careful reading of Latin authors, and of inscriptions as well, the widely scattered remains of the minor poetry of the Romans.

3. **Asiatic Anthologies.** Asiatic literature is extremely rich in anthologies, which consist sometimes of extracts from the best poets, arranged according to the subject, and sometimes of "beauties" of their best poets, with biographical notices, which are placed either in chronological order or according to the countries in which the authors lived.

4. **Arabic Anthologies.** The oldest Arabic anthology is the *Moallakat* (q.v.; see also *ANTAR*), consisting of the seven most celebrated pre-Islamic poems. A much larger collection was made by Abu-Temâm (died 846), who published selections from the old Arabic songs composed previous to the time of Mohammed, arranged them in 10 books and named the entire collection after the first book, which consisted of war songs, *Al Hamâsa*. A German translation by Rückert was published in 1846, under the title *Hamasa*. Another famous anthology is the *Divan* of the Hudhailites (an Arabic tribe), a partial edition of which was published by Kosegarten, and a German translation by Abicht (1879). Wellhausen completed the edition (Arabic and German) in 1887, as part i of *Skizzen und Vorarbeiten*, published by him. Abu'l-Faradj of Ispahan (died 967) gathered together in his *Kitâb al-Aghâni* ('Book of Songs') all the ancient Arabic songs down to the first centuries of the caliphate. It was published by Kosegarten in 1840; but the complete work, in 20 volumes, was not issued till quite recently by the Arabic press of Bulak, to which Brünnow added the twenty-first volume in 1888. An Index to this anthology has been prepared by a group of scholars under the editorship of I. Guidi. Abu'l-Faradj accompanied this work with a minute commentary, which makes it one of the most interesting parts of the old Arabic literature. But the richest and most complete anthology of the later Arabic poetry is *Yatimat al-Dahr* ('The Pearl of the World'), by Taalabi, in which the writers are arranged according to the provinces in which they lived. It has been continued and enlarged since the period of the original compiler. Besides these and similar national anthologies, collections have been made in almost every province where the Arabic culture and speech prevailed. Such, for example, are the numerous Arabico-Spanish anthologies, though these are but little known.

5. **Turkish Anthologies.** The number of anthologies in the West Turkish, or, as it is generally called, the Turkish language, is very large. Most of the poems, however, show a tendency toward imitation of the Persian, which is natural when one recalls the fact that, under the old Ottoman dynasty, Persian was the official language of the court and was generally used by the aristocracy and the cultivated classes. (See below.) The most famous are: *Hesht Behesht* ('The Eight Paradises'), by Sehi of Adrianople (died 1548); *Taskarat ash-Shuara* ('Lives of the Poets'), by Latifi (died 1582), and, under the same title, a similar work of Ashik Chelebi (died 1571); and the great col-

lection, *Subdat al-Ash'âr* ('The Blossoms of Poetry'), by Kassade (died 1621). The substance of these anthologies is to be found in Hammer Purgstall's *Geschichte der osmanischen Dichtkunst* (Pesth, 1836); and in Gibb's *History of Ottoman Poetry* in 5 vols. (1900-08).

6. **Persian Anthologies.** The Persian literature has many anthologies, which are called *safinah* (ship), *majmai* (collection), *bayâd* (album), *intikhâb* or *muntakhab* (selection), and the like. Among these are the *Muntakhab ul-ash'âr* ('Selection of Poems'), compiled in 1748; and the *Daqâ'iq ul-ash'âr* ('Subtleties of Poems'), compiled in the eighteenth century, which deals, as its name implies, especially with the more artificial styles of Persian poetry. The numerous biographical dictionaries of poets, called *Tadhkirat*, or memoirs, contain many verses from the poets whose lives are recorded. One of the most important of these is the *Tadhkirat ash-shu'ârâ*, written by Daulat-Shâh in 1487, and edited by E. G. Browne (London, 1902). The *Farhangi ash-shu'ârâ* ('Dictionary of Poets') contains an anthology of about 22,450 distichs in Persian, and was abridged and freely imitated by Hammer-Purgstall in his *Duftkörner aus persischen Dichtern gesammelt*, reedited by Bodenstedt (Stuttgart, 1860). Persian minor poetry is the most perfect in the world and its forms and tone can be traced not only in the anthologies of the Eastern peoples—the Turks, the Hindus, the Arabs, and the Chinese—but even in modern Occidental writers such as Thomas Moore. Flügel has given an interesting bibliographical catalogue (Vienna, 1865); and some very graceful verse translations by Hermann Ethé can be found in Geiger and Kuhn's *Grundriss der iranischen Philologie*, especially vol. ii (Strassburg, 1906), and in Ethé's scattered contributions to the *Morgenländische Forschungen*. Consult also Meynard, *La Poésie en Perse* (Paris, 1887).

7. **Indian Anthologies.** The literature of the Mohammedan population of Hindustan, which is a mere copy of Persian literature, has also several anthologies. The most important are: *Gulzâri Ibrâhîm* ('Rose Garden of Ibrâhîm'), by 'Alî Ibrâhîm, containing biographical notices of 300 Hindustani poets with specimens of their writings; the collection called *Diwâni Jihân* ('Divân of the World'), by Bēnî-Narāyan; *Gulshâni Hind* ('Garden of India'), by Mirzâ 'Alî Lutf; *Guldasta'i Nishât* ('Garland of Pleasure'), by Manû Lâl (Calcutta, 1836), and *Guldasta'i Nazninân* ('Garland of Delights'), by Karîm-ad-Dîn (Calcutta, 1845). The substance of these works is to be found in Garcin de Tassy's *Histoire de la littérature hindoue et hindoustanie* (2d ed., Paris, 1839-47), which, under the title of *Tabakâli Shurâi Hindi*, was translated into Hindustani by Karîm-ad-Dîn (Delhi, 1848). In the pure Hindu we have a rich collection of songs, the *Râgsâgar* ('Ocean of Musical Verse'), by Krishnânanda (Calcutta, 1845). The modern tendency of Hindu anthologies is wholly away from the Sanskrit, and the vernacular has been used especially, as by Rājā Siva Prasād, who died as recently as 1895. See Grierson, *Modern Vernacular Literature of Hindōstân* (1889).

8. **Sanskrit Anthologies.** The Sanskrit literature is not so rich in anthologies as are other Oriental literatures. But the collections, comprising a hundred strophes each (*Satakas*), and attributed to many poets, may almost be

termed anthologies. True Sanskrit anthologies are the *Saduktikarnāmṛta*, or 'Ear-nectar of Good Sayings,' by Sridharadasa (about 1205 A.D.), the *Sārṅgadharpaddhati*, or Anthology of *Sārṅgadhara*, and Vallabhadeva's *Subhāshitāvalī* ('Series of Good Words'). Böhtlingk, *Indische Sprüche* (3 vols., St. Petersburg, 1870-73), contains an anthology of 7613 Sanskrit strophes, with a literal German translation. Consult Frazer, *A Literary History of India* (1898).

9. **Chinese Anthologies.** The oldest anthology in the world is that which Confucius has handed down under the name of the *Shi-King*, or Book of Songs, forming one of the five great canonical books, or sacred classics of the Chinese. Chinese authors assert that about 3000 other poems were known in the time of Confucius. The *Shi-King* consists of 311 pieces, which picture vividly the manners and customs, the state of knowledge and art, and the aspects of nature in the states which afterward became China. It is, of course, written in the "book language" or classical Chinese of the literati, and time has made it almost unintelligible to those who speak only the vernacular dialects. But it is remarkable for the myriad allusions which it contains to the great body of Chinese literature and is extremely difficult because of the almost unlimited license of its word-order. The best translation with critical apparatus is by James Legge (London, 1876). There is also a version in Latin by Lacharme (Stuttgart, 1830) and one in German by Rückert (Altona, 1833). The poems of the Liang Dynasty (502-557 A.D.), and of the Tang Dynasty (618-905), have also been collected, but are only in part translated. Consult Giles, *A Chinese Biographical Dictionary* (1898); Giles, *Sun Tzu* (1910); and the article CHINESE LITERATURE.

10. **Japanese Anthologies.** The Japanese abound in anthologies, since they consider poetry more as the production of an epoch than of an individual. The oldest and largest anthology, compiled in the eighth century, is called *Manyōshū*, or *Collection of Ten Thousand Leaves*. It contains 4565 songs, mostly in 31-syllable poems. The *Kokinshū*, or *Songs Ancient and Modern*, numbering 1099, was finished about 922. Another anthology of the same century, *Gosen Wakashū*, contains 1356 short poems. Other collections were made by order of the Mikados in the succeeding centuries, ending with the fifteenth, and these, with *Songs Ancient and Modern*, are known under the general name of the *Anthologies of the One and Twenty Reigns*. All of these books have had abundant commentary, and are valuable to the student and historian. As is the case with almost everything in Japanese, the Chinese influence is apparent; but during the last 50 years, since Japan became Occidentalized, the vernacular has largely changed, and recent anthologies show a decided alteration in spirit, thought, and vocabulary, which bring the verse close to the manner of French and German lyrical writers. There are innumerable collections made by imperial or private order, besides many selections of 100 songs each, the most famous of the latter being the *Hiaku-nin-is-shiu* (100 poets, one verse), translated into English with notes by F. V. Dickens (London, 1866), and Clay MacCauley (Tokio, 1899). Consult, also: Leon de Rosny, *Anthologie japonnaise* (Paris, 1870); B. H. Chamberlain, *Classical Poetry of the Japanese* (London, 1880); Aston, *A History of Japanese*

Literature (1899); and for a sympathetic interpretation, Hearn, *Japan* (1904).

AN'THON, CHARLES, LL.D. (1797-1867). An American classical scholar and teacher. He was born in New York City, graduated at Columbia College in 1815, studied law and was admitted to the bar in 1819, but never practiced. The next year he became adjunct professor of Greek and Latin at Columbia; after 15 years, he became full professor. From 1836 to 1867 he was also head master of the grammar school of Columbia College. He was exceedingly efficient as a teacher and won considerable reputation by his annotated editions of a large number of classical authors, prepared as school and college text-books. Besides nearly 50 such works, he published a new edition of Lemprière's *Classical Dictionary* (1825); a new Classical Dictionary (1841, 1855, 1874); manuals of Greek and Roman antiquities (1843, 1852, 1874); *A System of Greek Prosody and Metre* (1840, 1852); *Ancient and Mediæval Geography* (1855); and a number of other handbooks which were long and extensively used by classical students, both in this country and in England. The value of his editorial labors lay largely in the fact that by his books he directed the attention of American classical students to the valuable works produced by German scholarship; he thus gave a great impetus to the higher and more fruitful study of the classics in America. Consult Henry Drisler, *Commemorative Discourse* (New York, 1868).

ANTHONY, ăn'thō-ni. A city, and the county-seat of Harper Co., Kan., 57 miles southwest of Wichita, on the Missouri Pacific, the Atchison, Topeka, and Santa Fe, the Kansas Southwestern, the Kansas City, Mexico, and Orient, and the Chicago, Rock Island, and Pacific railroads (Map: Kansas, D 4). It controls a trade in the products of the surrounding agricultural and stock-raising region and has a salt plant, an ice plant, and a flour mill. Anthony has a large opera house, two hospitals, a Carnegie library, and seven churches. The city owns the water works and electric light plant. It has adopted the commission form of government. Pop., 1890, 1806; 1900, 1179; 1910, 2669.

ANTHONY, ăn'tō-nī, CLEMENS THEODOR (1755-1836). King of Saxony. Upon the death of his brother Frederick Augustus I, on May 5, 1827, he succeeded to the throne. After the disturbances of 1830 he appointed his nephew, Prince Friedrich August, co-regent, and on September 4 of the following year he gave his sanction to a constitutional government for the kingdom.

ANTHONY, HENRY BOWEN (1815-84). An American journalist and legislator. He was born at Coventry, R. I., and graduated at Brown University in 1833. He became editor of the *Providence Journal* in 1838 and continued as such for more than 20 years. In 1849, and again in 1850, he was elected Governor of Rhode Island, on the Whig ticket. He was a Republican member of the United States Senate from 1859 until his death, and served twice (1863 and 1871) as president *pro tem*. A collection of his historical and memorial addresses was printed for private circulation in 1875. He bequeathed to Brown University the Harris collection of American poetry, containing about 6000 volumes. Consult the *Anthony Memorial* (1886), a catalogue of the collection, with a sketch of the donor.

ANTHONY, JOHN GOULD (1804-77). An American conchologist. He was born at Providence, R. I., and for many years was in commerce, but his studies in natural history resulted in his being invited by Prof. Louis Agassiz, in 1863, to the directorship of the conchological department of the Museum of Comparative Zoölogy at Harvard University. In 1865 he accompanied Professor Agassiz on the Thayer expedition to Brazil. He was an acknowledged authority in his field of research, and published: *A New Trilobite: Ceratocephala Ceralepta* (1838); *Descriptions of Three New Species of Shells* (1839); *Descriptions of New Species of American Fluviate Gasteropods* (1861); *Descriptions of New American Fresh-Water Shells* (1866), and other works.

ANTHONY, SAINT. See ANTONY, SAINT.

ANTHONY, SAINT, CROSS OF, or the **TAU CROSS.** A cross, shaped like the letter T. In heraldry the name denotes an ordinary cross consisting of two stripes, one horizontal, the other vertical, crossing each other in the centre of the escutcheon.

ANTHONY, SAINT, FALLS OF. See MINNEAPOLIS.

ANTHONY, SAINT, FIRE OF. See ERYSIPELAS. The Rev. Alban Butler, in his *Lives of the Saints*, gives the following account of the origin of this name: "In 1089 a pestilential erysipelatous distemper, called the *sacred fire*, swept off great numbers in most provinces of France; public prayers and processions were ordered against this scourge. At length, it pleased God to grant many miraculous cures of the dreadful distemper to those who implored his mercy through the intercession of St. Anthony, especially before his relics; the church [of La Motte St. Didier, near Vienne, in Dauphiné] in which they were deposited was resorted to by great numbers of pilgrims, and his patronage was implored over the whole kingdom against this disease." The "Order of Canons Regular of St. Anthony," a religious fraternity, founded about 1090, for the relief of persons afflicted with the fire of St. Anthony, survived in France till 1790.

ANTHONY, SUSAN BROWNELL (1820-1906). An American reformer, born in South Adams, Mass., the daughter of a Quaker. She taught school for 15 years; was active in the total abstinence and anti-slavery movements; advanced a belief in the coeducation of the sexes; and from the Civil War devoted herself entirely to the woman suffrage movement. It was largely the result of her effort that married women in New York State were given the guardianship of their children and the control of their own earnings as early as 1860. She founded (1868) and for three years published *The Revolution*, a woman's rights paper. She was arrested, tried, and fined for voting at the election of 1872. An eloquent speaker, she lectured extensively in England and throughout the United States, and took part in many State campaigns and appeared before many Congressional committees. In 1899 Miss Anthony was a delegate to the International Council of Women, held in London. Two years later she retired from an office she had held for many years, the presidency of the National American Woman Suffrage Association. She contributed to leading magazines and (with Mrs. Elizabeth Cady Stanton and Mrs. Matilda Joslyn Gage) published an extensive *History of Woman Suffrage* (3 vols., New York, 1881-87). For her life, consult Harper, *Life and Work of*

Susan B. Anthony (3 vols., Indianapolis, 1899); Alice Hubbard, *Susan B. Anthony* (East Aurora, 1909).

ANTHONY, WILLIAM ARNOLD (1835-1908). An American physicist. He was born at Coventry, R. I., graduated at the Sheffield Scientific School of Yale University, and was professor of physics and chemistry in Antioch College (Ohio) from 1867 to 1869. From 1869 to 1872 he was professor of physics at the Iowa Agricultural College, and from 1872 to 1887 professor of physics at Cornell University. In 1887 he became a consulting electrician. From 1893 to 1908 he was professor of physics in the Cooper Union School of Science. He contributed a chapter to E. A. Thompson's *Roentgen Rays and Phenomena of the Anode and Cathode* (1896); wrote (with C. F. Brackett) a *Manual of Physics*, and published in 1902 a *Theory of Electrical Measurements* (3d ed., 1908).

ANTHONY DE DOM'INIS. See DOMINIS.

ANTHONY OF BOUR'BON. See ANTOINE DE BOURBON.

ANTHONY'S NOSE. A projecting bluff on the Hudson south of West Point, said to have been named after a trumpeter of Governor Stuyvesant.

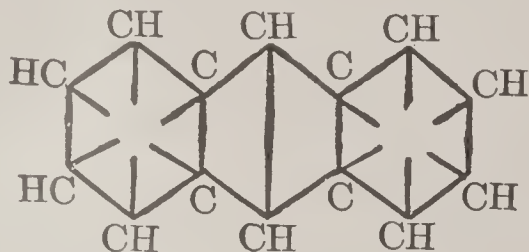
ANTHOPH'YLLITE. A name applied to an orthorhombic mineral of the amphibole group, containing the metals magnesium and iron and silic acid. It commonly occurs in lamellar or fibrous masses that have a vitreous lustre and vary in color from brown to green. A "hydrated anthophyllite" has been described in several instances, but in most cases the mineral has been shown to be really a hydrated monoclinic amphibole. Anthophyllite occurs in metamorphic rocks.

AN'THOXAN'THUM. See SWEET VERNAL GRASS.

AN'THOZO'A (Gk. *ἄνθος*, *anthos*, flower + *ζῷον*, *zōon*, animal), or **ACTINOZOA.** A class of cœlenterates, characterized by their polyp-like form. It contains the sea-anemones and all the corals except millepores. See **CŒLENERATA**; **CORALS**; **SEA-ANEMONES.**

AN'THRACENE (Gk. *ἄνθραξ*, *anthrax*, coal) $C_{14}H_{10}$. An organic substance composed of carbon and hydrogen and obtained from coal-tar. The production of anthracene has been of great commercial importance since the discovery of the processes by which it is converted on a large scale into the valuable alizarin dyes. (See **ALIZARIN**.) The portion of coal-tar passing, during its distillation, above 270° C., contains a considerable amount of anthracene; when this portion is cooled, a mass of crystals is deposited, which is separated from the liquid oil by pressure and purified by digesting with the naphtha obtained from another fraction of the coal-tar, viz., the so-called light oil, which passes below 170° C. The product somewhat purified in this manner is brought into commerce under the name of "50 per cent anthracene" and is employed in the manufacture of alizarin. To isolate pure anthracene from this product, it is distilled with potash, and the distillate is treated with carbon disulphide, in which anthracene is nearly insoluble; the remaining traces of impurities may then be eliminated by recrystallization from hot benzene. Pure anthracene is a colorless crystalline substance melting at 213° C. and boiling at 360° C.: it is insoluble in water and but sparingly soluble in alcohol. Graebe and Liebermann obtained it from the coloring

matter of madder, and then, by reversing the process, artificially prepared that coloring matter (alizarin) from anthracene. All commercial anthracene contains more or less carbazol. The chemical constitution of anthracene is represented by the formula:



Consult Auerbach, *Das Anthracen und seine Derivate* (Brunswick, 1880), and Guelm, *Die Anthracenfarbstoffe* (Brunswick, 1897).

ANTHRACITE (Gk. *άνθρακίτης*, *anthrakitēs*, from *άνθραξ*, *anthrax*, coal). A term used to designate the highest grade of coal, or that having the highest percentage of fixed carbon and lowest volatile contents of all the coals. It has been produced from bituminous coal by alteration through the action of pressure and heat. These conditions are produced when rock-masses are folded up into mountains, or when beds of bituminous coal are approached or penetrated by an intrusion of igneous rock. In passing from the horizontal coal measures of western Pennsylvania and Ohio to the greatly folded beds of eastern Pennsylvania, the coal changes from bituminous to anthracite. At Crested Butte, Colo., beds of bituminous coal are found to change to anthracite in those portions of the mass which are in close proximity to basaltic rocks that have been intruded into the beds underlying the coal in that region. The process involves distillation with evolution of gaseous compounds and is probably controlled to some extent by the relative porosity of the overlying rocks, as well as by the varying degree of heat to which the coal is subjected.

Anthracite has great heating power; it burns slowly, giving off but little smoke, and is consequently very clean. The average chemical composition of anthracite coal from different localities is as follows:

	Fixed carbon matter	Volatile	Water	Ash	Sulphur
Mammoth vein, Pa.	86.38	3.08	4.12	5.92	.50
Anthracite, Colo...	82.33	9.96	.81	6.90	1.06
Madrid, N. Mex. ..	93.02	1.04	.16	5.78	.117
Shan-si, China	82.74	5.55	1.55	10.15	.25

Anthracite is found at a number of widely separated localities; but the areas underlain by it are seldom large because its formation is dependent on local conditions. In the United States it is found in eastern Pennsylvania, where it forms several detached areas aggregating about 470 square miles. These fields are known as the Southern, or Schuylkill field (140 square miles); Western Middle field (90 square miles); Eastern Middle field (40 square miles); Northern, or Wyoming (200 square miles); Loyalsock, or Western Northern. The coals all belong to the Middle Carboniferous or Pennsylvania Series, at the base of which is a hard bed known as the Pottsville conglomerate. After beds of the Coal measures had been folded into basins, the presence of the outcropping ledges of conglomerate along the crests of the ridges protected the coal beds to a large extent and have kept them from

being entirely worn away by weathering and erosion. The total number of workable anthracite seams is about 15, but several others are also known. The aggregate thickness of the beds increases from west to east; the best known is the Mammoth Bed, which in places may exceed 100 feet in thickness, while elsewhere it may split up into several beds separated by layers of shale. Wilkes-Barre, Scranton, Hazleton, and Pottsville are important mining towns in the region. At Crested Butte in Colorado, and near Madrid, N. Mex., anthracite is found in beds of Upper Cretaceous age, the formation of the anthracite in each case being due to igneous intrusions. Indeed, at the latter locality, the change from bituminous to anthracite coal takes place within a distance of 2000 feet. In Europe anthracite coal is found in the Carboniferous of South Wales. It is also known in France and Belgium. What are probably the largest deposits in the world are those around Tse-Chau in the province of Shan-si, China. Baron von Richthofen estimated that the unmined anthracite coal in Shan-si amounted to 630,000,000,000 tons, and that the area was greater than that of Pennsylvania.

Anthracite coal, after mining, goes through a crushing and sorting process in coal-breakers, in which the machinery consists of crushing rolls and screens. In this treatment the coal is separated into the different sizes given below, and particles of slate are eliminated. Much of the latter is separated by screens having the bars set at an angle, so that when a mixture of coal and slate passes over them the slate particles, owing to their thinness, slip through, while the coal passes by. Pieces of mixed coal and slate are known as *bone-coal*, and are picked out by boys when the smaller sizes of coal come down the shutes from the screens. Recently, wet methods of separation of slate and coal, by means of jigs (q.v.) have been adopted with great success. The capacity of some breakers is very large, being as much as 2000 to 3000 tons of marketable coal per day of 10 hours.

The following sizes are shipped from the breaker:

Broken, or grate coal, which passes through 4-inch mesh, but not through 2.5-inch mesh.

Egg coal, which passes through 2.5-inch mesh, but not through 1.75-inch mesh.

Stove coal, which passes through 1.75-inch mesh, but not through 1.25-inch mesh.

Chestnut coal, which passes through 1.25-inch mesh, but not through .75-inch mesh.

Pea coal, which passes through .75-inch mesh, but not through .50-inch mesh.

Buckwheat coal, which passes through .50-inch mesh, but not through .25-inch mesh.

Very coarse lumps are known as "steamboat coal," and the finer sizes are now separated into two kinds, which are known as rice and barley. The finest refuse from the breakers and mines is known as "culm" and has been a source of much concern, since, through being considered as waste, it has been allowed to collect in enormous heaps, forming a marked topographic feature of the anthracite regions. Owing to the fineness of this material, it was for some years found difficult to burn it in grates, as it packed and hindered the entrance of air. In recent years methods of utilization for culm have been found, and many of the banks have been worked over and the coarser particles washed out and sized. It can be burned in specially constructed

grates, or can be mixed with tar and pressed into briquettes for use with the ordinary grate. Another important use is for filling in abandoned or partially worked-out mines, which is done by washing the culm down through a pipe into the mine, where it settles into a compact mass.

In the trade anthracite is sometimes classed as follows: Free burning, white ash, hard white ash, Wyoming red ash, Lehigh red ash, Shamokin, Lykens Valley red ash, Schuylkill red ash, Trevorton, Lorberrry red ash, and Bernice white ash. The hard white ash commands the best price.

The production of anthracite coal in Pennsylvania from 1907 to 1911 was as follows:

Year	Total product long tons	Value at mines	Average price per ton	No. employed	Average no. days worked
1907	76,432,421	\$163,584,056	\$2.14	167,234	220
1908	74,347,102	158,178,849	2.13	174,174	200
1909	72,384,249	149,181,587	2.06	166,801	205
1910	75,433,246	160,275,302	2.12	169,497	229
1911	80,771,488	174,952,415	2.17	172,585	246

It is also of interest to note the increase in shipments since the beginning of the industry:

ANTHRACITE COAL SHIPMENTS, 1825 TO 1911

1825	34,893 long tons	1870	16,182,191 long tons
1830	174,734 " "	1880	23,437,242 " "
1835	560,758 " "	1890	36,615,459 " "
1840	864,379 " "	1900	45,107,484 " "
1845	2,013,013 " "	1911	69,854,299 " "
1860	8,513,123 " "		

The exports of anthracite in 1911 were 3,553,999 long tons valued at \$18,093,285, and the imports 2463 long tons valued at \$12,550.

The production of anthracite in Colorado and New Mexico combined amounted to 98,561 short tons in 1911. Various estimates of the amounts of anthracite remaining in the Pennsylvania fields have been made, and all agree in the conclusion that the deposits will last at the present rate of production for more than 100 years. For illustration, see COAL.

Bibliography. For statistics of production, consult volumes on *Mineral Resources*, issued annually by the United States Geological Survey; various reports of the Second Geological Survey of Pennsylvania, and the Annual Reports of the Bureau of Mines, Pennsylvania. For description of occurrence, see *Coal Resources of the World*, an exhaustive work prepared by the XII session of the International Geological Congress, Toronto, 1913. Consult also: J. J. Stevenson, "Origin of Pennsylvania Anthracite," *Bulletin of the Geological Society of America*, vol. v, p. 39 (Rochester, 1894); M. R. Campbell, "Hypothesis to Account for the Transformation of Vegetable Matter into the Different Grades of Coal," *Economic Geology*, vol. i (Lancaster, Pa., 1905); N. F. Drake, "Coal Fields around Tse Chau, China," *Transactions of the American Institute of Mining Engineers*, vol. xxx (New York, 1898). See also COAL; PENNSYLVANIA.

ANTHRAC'NOSE (Gk. *ἀνθραξ*, *anthrax*, carbuncle + *νόσος*, *nosos*, disease). A group of fungus diseases of plants, in which the fruits, stems, and leaves suffer serious injury. Common forms are found upon beans, blackberries,

raspberries, cucumbers, egg-plants, grapes, cotton, peppers, and spinach. Species of *Colletotrichum* and *Glaeosporium* cause most of these diseases. About 500 species have been described under these genera, but it is now believed they may be reduced to a very few. The perfect forms of most of the species are now referred to the genus *Glomerella*. In the fruit attacked definite round discolored spots or pits appear, with a usually 'light-colored' centre, surrounded by darker zones. See GRAPE; BEAN, and the other plants mentioned above.

AN'THRACO'SIS. A disease peculiar to coal-miners, incident to long-continued inhalation of coal dust. The lungs are subjected to constant irritation, become black from deposited coal particles, fibrous tissue increases at the expense of the air spaces, and hard, nodular areas are formed, which tend to undergo ulceration. Such lungs are peculiarly liable to become tuberculous. See PNEUMOKONIOSIS.

AN'THRAPUR/PURIN. See PURPURIN.

AN'THRAX (Gk. *ἀνθραξ*, coal, carbuncle, malignant pustule; Fr. *charbon*). An acute, febrile, infectious disease produced by the *Bacillus anthracis*. The disease is known as charbon, splenic fever, milzbrand, carbonchio, mjeltbrant, and Siberian plague; in man as carbuncle or malignant pustule, wool-sorter's disease, and, incorrectly, malignant œdema.

Anthrax was the first disease traced to bacterial generation. It is most prevalent among herbivorous animals—cattle, horses, sheep, and goats—varying in relative frequency with the region. The camel and various members of the deer family are frequently affected. Anthrax is frequently transmitted to man, especially through abrasions of the hands of those who handle infected wools or hides. It may also be implanted in the lungs through inhalation of infected spores and, though rarely, in the intestines through swallowing food containing anthrax spores. The chief general anatomical changes are hemorrhages, by which all the organs are often permeated, serous, gelatinous, and hemorrhagic infiltrations of the subserous, submucous, and subcutaneous connective tissue, swelling of the spleen and parenchymatous inflammation of the liver and kidneys, and a tar-like condition of the blood. Œdema, fever, diarrhœa, delirium, and hemorrhages are followed speedily by death.

Enzoötic outbreaks of anthrax have been known from time immemorial and in all parts of the globe. In cattle veterinarians distinguish three forms of anthrax: per-acute or apoplectic, in which the animal suddenly drops to the ground and dies in convulsions after a few minutes or at most an hour; the acute form without external swellings, most frequent in cattle, in which the temperature is increased to from 40° to 42° C.; restlessness and excitement, or general prostration, and labored breathing appear, and death supervenes, with signs of asphyxia, in from 10 to 24 hours; the sub-acute form, which is rare, with symptoms the same as in the acute form, but less pronounced, death occurring in from one to seven days.

In both horses and cattle an external form of anthrax occurs, in which tumors or carbuncles develop under the skin. These tumors are distinguished from those of black-leg by the fact that they do not emit a crackling sound on being stroked. Before death the discharges of the body may become mucous or even bloody. In animals

which die of anthrax, blood-clots are found on nearly all the vital organs, and the spleen is enlarged to from two to five times its normal size. If needful, a definite diagnosis may always be made by an examination for the presence of the anthrax bacillus, which may be found in the blood within 16 to 18 hours before death.

In countries subject to the ravages of anthrax, the disease is usually restricted to well-defined areas, which seem to be permanently infected. Anthrax is most common in localities subject to inundation. Ponds of stagnant water and streams polluted with the waste from tanneries and morocco factories may serve as sources of infection. Perhaps the most common means for the spread of anthrax infection is found in the bodies of animals dead of the disease. The anthrax bacillus may gain entrance to the body of an animal in the inspired air, in food or water, or in wounds of the skin. The rapidity with which the different symptoms of anthrax develop depends largely upon the relative resisting power of the animal.

The bacillus in blood drawn from affected animals and dried may remain virulent for a month or longer. Anthrax spores may retain their vitality in the soil for an almost indefinite period, especially if situated at some depth, where they are protected from the action of light and oxygen. Putrefaction destroys the vegetative form of the bacillus, but does not affect the spores. In the filamentous form the bacillus is killed by exposure to a temperature of 55° to 58° C. for 10 to 15 minutes. The spores are very resistant to dry heat, a temperature of 120° to 140° C. for three hours being required to kill them.

Domestic animals may be immunized in practice by attenuated living cultures of the bacilli, by spore-containing cultures, by immune serum, and by immune serum and living cultures.

Active immunization by vaccination has been extensively practiced, as the organism may be attenuated in a variety of ways. The first developed and the one most commonly used is that established by Pasteur in 1881. He found that when grown at a temperature of 42° to 43° C. the pathogenicity of this bacillus gradually decreases until injections no longer cause the death of rabbits, and if continued even the mouse will not succumb, the bacilli in such cultures dying in about a month. Pasteur's method of protective vaccination consists in the injection subcutaneously of a culture attenuated by 24 days' growth at a temperature of 42.5° C., followed in 10 to 12 days by an injection of a stronger vaccine, i.e., one attenuated by a growth of but 12 days at the same temperature.

In 1911 Dawson prepared a single vaccine, which differs from the Pasteur vaccine only in the degree of attenuation and in that it is applied but once. This vaccine is recommended for use when animals are dying from the disease and an immediate protection is necessary. A passive immunity may be established within a few hours by the injection of an immune serum, but such immunity lasts for but one to two weeks.

In primary local affection of the skin, subcutaneous tissue, or the visible mucous membrane, deep incisions should be made, and after thorough scraping the wound should be repeatedly washed and cauterized. In cases of generalized disease which are not far advanced, the treatment with immune serum gives good results. In

the prevention of anthrax the main reliance of the stockman is to be placed in vaccination. Anthrax vaccine may now be purchased of wholesale druggists and has proved very efficient in the prevention of the disease. The most important sanitary measure to be adopted in case of an outbreak of anthrax is the immediate and complete destruction of animal carcasses. This is best accomplished by burning. If anthrax carcasses are not destroyed, the contagion may be spread in the soil and water, and may also be carried by flies, buzzards, dogs, and other carnivorous animals. The thorough sterilization of hair, wool, and animal skins by steam, dry heat, or otherwise, will prevent the infection of man from handling these products.

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AN'THROPO-(from Gk. *ἄνθρωπος*, *anthrōpos*, man, human being). A combining form occurring at the beginning of many English words, especially scientific terms, and denoting that the word has something to do with *man* or *mankind*; e.g., *anthropo-geography*, the geographical distribution of mankind; *anthropology*, the science of man; *anthropophagy*, man-eating, or cannibalism; etc.

AN'THROPO-GEOG'RAPHY (Gk. *ἄνθρωπος*, *anthrōpos*, man + *γεωγραφία*, *geōgraphia*, geography). A division of bio-geography which describes the distribution of the varieties of mankind and depends upon anthropology as the science from which it derives its facts regarding the types of men. Both in Germany and France the literature on the subject is assuming considerable dimensions. Prof. Friedrich Ratzel was appointed to the chair of anthropo-geography at Leipzig, in 1866. His *Anthropo-geographie* (Stuttgart, 1899) is a type of this division of geography. Anthropo-geography is treated in more or less detail in most recent works on ETHNOLOGY (q.v.). The most important American work in this field is Semple, E. C., *Influences of Geographic Environment* (New York, 1911). See also GEOGRAPHY, ECONOMIC; ANTHROPOLOGY.

AN'THROPOID APES. See APE.

AN'THROPOL'ATRY (Gk. *ἄνθρωπος*, *anthrōpos*, man + *λατρεία*, *latreia*, worship). A term signifying, according to its derivation, the worship of man, and always employed in reproach. Thus, the early Christians accused the heathen of anthropolatry because in their mythology men were represented as exalted among the gods, although an *apotheosis* (q.v.) was in these cases alleged by their worshipers; and the heathen retorted the charge of the worship of Christ, the reply to which was the assertion of his divinity. But the term is chiefly known in ecclesiastical history in connection with the employment of it by the Apollinarians against the orthodox Christians of the fourth and fifth centuries, who in worshiping Christ worshiped, as

was affirmed, only a man in whom God dwelt. See APOLLINARIS.

AN'THROPOL'OGY (Gk. *ἄνθρωπος*, *anthrōpos*, man + *λόγος*, *logos*, discourse, science). The science of man. Originally the term signified the zoölogy and comparative anatomy of man, but has long since come to have a much wider meaning. Like any other science it now has certain problems of its own according to which its province is determined rather than by the etymology of its name or even its historic development. The fundamental problems of anthropology are the relative antiquity of man's first appearance upon the earth, his subsequent distribution and career. To some extent these problems are shared by other sciences: thus the relative time of man's appearance upon the earth is largely a geological problem in that the ages of the various strata bearing traces of man must be determined entirely by geological methods. Again man's relation to mammals is in the main a zoölogical and palæontological problem for whose solution we must look to special students of those subjects. When, however, we come to man's distribution and career on the earth, we not only deal with the most distinctly human character in the world, but with a problem almost peculiar to anthropology. Anthropologists use the term "culture" to designate the results of man's activities or those characteristics not subject to inheritance. A human being comes into the world with certain instincts or tendencies to act, which may be designated as his biological equipment for life. With the nature of this equipment the zoölogist, physiologist, and psychologist are concerned. The anthropologist, on the other hand, is concerned with the functioning of this equipment, especially those instincts that lead to the production of culture. Though culture is not inherited, it is accumulative in that each group of people tends to preserve and conserve its experience.

It may be necessary to distinguish between the field of anthropology on the one hand and those of history and sociology on the other. While each deals with certain aspects of the cultural problem, they stand quite apart. History has to do with the culture of peoples having more or less definite records, or, at least, with such as have immediate connection with historic cultures. Anthropology takes up the prehistoric period of culture and the savage and primitive groups still living, but not constituting integral parts of the historic nations. The distinction is here fairly definite. Sociology concerns itself with the special social equipments of man and especially with the many practical problems that confront our own social life. To the social activities of non-historic peoples it seldom refers, except for illustrative data and suggestions as to theories for social origins.

It appears, then, that the peculiar and distinctive group of problems in anthropology are those that refer to culture. As we have noted, certain aspects of the antiquity of man are geological problems, but the presence of man in the past is usually determined by the remains or by-products of his cultural activities rather than by his own bones. When such objects are found in a given strata, such as broken flints, cracked animal bones, etc., it is for the anthropologist to say whether the objects in question were made by man and to determine from them what form of culture was practiced by their makers. The geologist is to be called upon to determine

the age and conditions of the particular strata in which the objects were found, but with the cultural problem he has nothing to do, that being the peculiar province of the anthropologist.

There are several subheads under which the data of anthropology are grouped, viz., ethnography, ethnology, archæology, and physical anthropology. The first concerns itself chiefly with the classification and distribution of mankind. Ethnology gives its attention to the cultures of living people, their language, art, religion, social organization, industrial arts, etc. Archæology is the combined ethnography and ethnology of extinct peoples. Physical anthropology concerns itself with comparative studies of the anatomy and physiology of the different peoples, seeking to establish criteria by which the hereditary relationships of the different peoples of the earth may be determined.

The biological sciences have a fundamental conception in the doctrine of evolution which, once comprehended, gives one a general understanding of the whole. Some years ago anthropologists attempted to build their science upon the same conception, as the writings of the period attest, but it is now generally accepted that while the conception applies well enough to man's biological equipment, or to that part of him that is transmitted by heredity, it is not consistent with the facts of cultural development. When one recalls the fact that the biological theory of evolution is based upon descent, it is not strange that the conception should fail in its application to phenomena that are not hereditary but perpetuated by education and imitation. When this point became clear to anthropologists, they formulated what is known as the historical or cultural point of view as opposed to the biological or evolutionary.

The biological or evolutionary point of view was never very clearly formulated, but was an assumption that the law of progressive development held for all forms of culture. It was assumed that the transition of a people from a hunting to an agricultural mode of life, for example, was a normal or even a necessary course of development and a step almost certain to be taken sooner or later by every group of people. In conformity to this theory attempts were made to grade all the cultures found in the world into a progressive series of higher and lower, the most notable being the work of Sir John Lubbock. The difficulty in this case was that a genetic relationship had of necessity to be assumed between all the groups in the scheme ranging from the lowest savagery to the highest civilization, whereas data to support such assumptions were wanting. To prove definitely genetic relationship between types of culture we must know the cultural history of particular peoples. Direct data of this kind from non-historical peoples are scarcely to be had, but as the study of primitive cultures progressed anthropologists found a great deal of indirect data and noted conditions not consistent with the genetic view. During this period of development several important theories were developed: the animistic hypothesis of Tylor accounting for the origin and life history of religious and philosophical concepts; the social evolution of Morgan, Westermarck, et al., accounting for the origins of marriage, exogamy, etc.; the totemic conception in whose development Frazer played the leading rôle; the theory of industrial evolution as developed by Tylor and Balfour, or the

notion that by arranging objects made by man in what seemed to be their most logical order, we can discover their genetic relationship; and, finally, the evolution of art as demonstrated by Haddon and others, the theory being that the origins of conventionalized designs and even simple geometric figures may be discerned by tracing them back to their realistic prototypes. (For similar attempts at the evolution of language, see ARYAN and LANGUAGE.) The chief leaders in this development were Englishmen, Morgan being the only American contributor. This development was certainly due to the influence of Darwin and his contemporaries.

All the preceding conceptions were worked out somewhat deductively and, with one or two exceptions, without resort to direct investigation. The method was to take extracts from the books of travelers or to select objects from museum collections in such a way as to illustrate the workings of each theory.

This period was followed by the one in which we now find anthropology, a period marked by intensive field-research among the peoples now living and highly developed techniques for the excavation and analysis of archæological remains. In this American anthropologists have played a leading part. The result has been the general abandonment of the preceding hypothesis as to the origin of culture and the formulation of several important principles of development.

Among these are the secondary association concept, the principles of convergent evolution, the tribal pattern theory, and independent development, all of which are in opposition to the fundamental concepts in the anthropology of the preceding period. Secondary association is conceived of as the bringing together of unrelated phenomena by historic contact or purely accidental means, such connection having neither functional nor genetic significance. Convergent evolution is the idea that two peoples may arrive at the same form of culture by entirely different steps and methods. The tribal pattern theory is that when once a people have developed definite ideas on religious, moral, or artistic subjects, they tend to recast all new ideas and practices and thus give them the same general pattern. All of these may be considered as definitely established, since authentic examples are available. The last, however, is less conclusive, for, though some examples of independent development are known, there are still able defenders of the theory that similarity of cultures means unity of origin. In the latter Graebner of Germany is the leader, in the former Boas of America. No one denies that both principles operate, but the partisans of one consider the other of minimum importance. All of these views are in one respect opposed to the hypothesis of the earlier period, for in any case the cultural history of a people cannot be reconstructed theoretically. One must know the history of a tribe before he can say which of these principles will account for its culture. This is an empirical point of view, and it is this generalized conception that is now known as the historical or cultural point of view in anthropology.

The practical problems now confronting anthropologists are the collection and recording of facts of human culture among the rapidly vanishing primitive peoples, and the systematic archæological survey of the earth's surface, both supplemented by anthropometric and anatomical

studies of living races and skeleton material. Specimens of many kinds are gathered into museums where some kinds of investigations are made, but the real work is done in the field and not in the museum or laboratory. See MAN; ETHNOLOGY; ANTHROPOMETRY.

Bibliography. F. Boas, *The Mind of Primitive Man* (1910); J. G. Frazer, *Totemism and Exogamy* (1910); A. Goldenweiser, *Totemism, an Analytic Study* (1911); A. C. Haddon, *Evolution in Art* (1895) and *History of Anthropology* (1910); A. Lane-Fox Pitt-Rivers, *The Evolution of Culture and Other Essays* (1906); L. H. Morgan, *Ancient Society*, 1878; E. B. Tylor, *Primitive Culture* (1895).

ANTHROPOLOGY, CRIMINAL. See CRIMINOLOGY.

ANTHROPOLOGY, THEOLOGICAL. A theological system which considers man as being the subject of sin and grace. It consequently considers his natural powers, so far as these relate to moral action and states—the moral intuitions, conscience, the affections, the will, habit—the original sin of Adam and its effects upon himself and upon his posterity, the corruption of nature, technically called “original sin,” and the fall, heredity, the bondage of the will, and imputation. To these topics certain others are often added, such as the origin and antiquity of man, the origin of the soul (whether by creationism or traducianism), and the unity of the human race. See SIN, GRACE, ETHICS, ORIGINAL SIN, FALL, IMPUTATION, SOUL, CREATIONISM, TRADUCIANISM.

AN'THROPOM'ETRY (Gk. *ἄνθρωπος*, *anthrōpos*, man + *μέτρον*, *metron*, measure). A method of measurement pursued in anthropology. The primary measurements are those of the normal body at rest, and include stature, weight, circumference of head, reach (or span of extended arms), circumference and expansion of chest, length of arm and leg, sitting height, circumference of waist, limbs, hips, and shoulders, length of forearm and thigh, size of foot, length of fingers, size and position of ear, facial angle (i.e., degree of prognathism), shape of head, size and form of nose, position and attitude of eyes, etc. Of these elements of the human body, only a few are commonly regarded as of ethnic significance, or of use in describing and comparing peoples or races considered collectively; the elements commonly so employed comprise stature, size and shape of head, facial angle, relative length of limb, attitude of eyes, etc. Some or all of the other elements receive special consideration in studies and comparisons of selected classes of population, e.g., school-children of various ages or grades; and certain of the elements are customarily recognized in the study of individuals, such as athletes, criminals, etc. With these definitely quantitative measurements, other individual or typical attributes of the human body are commonly correlated; chief among these are color (of skin, hair, eyes, mucous membrane, nails, etc.), character of pelage (scalp hair, beard, axillary and pubic hair, body hair), local and general texture of integument, form and mobility of features, etc. Other measurements of common use in anthropologic studies are those of the skeleton, particularly the skull, jaws, and long bones. Various anthropologists, like Manouvrier, Deniker, and Pearson, have devised formulas for determining stature from the length of femur, tibia, humerus, and other long bones; and the relative dimensions of the differ-

ent bones of the skeleton are commonly regarded as ethnic indications. The forms of certain bones are also deemed ethnic criteria; the flattening of the tibia (platycnemism) and the perforation of the humerus in the olecranon fossa have received especial consideration in this connection. The measurement of the skull has been developed into a system known as craniometry. A leading feature in this aspect of anthropometry is the cranial index, i.e., the breadth of the skull in proportion to its length as viewed from above (in the *norma verticalis*); and three types are commonly defined as dolichocephalic or long-head, mesocephalic or round-head, and brachycephalic or broad-head varieties of the genus *Homo*, the ratios of breadth to length being about 70: 100, 80: 100, and 85: 100, respectively.

Another important feature of the system is the capacity of the brain-case, measured by means of liquid or fragmental substances (water, glycerin, sand, fine shot, or small seeds), poured into the cavity and afterward weighed or gauged, or by aid of a thin, elastic, and impervious bag inserted through the foramen magnum and afterward filled with liquid; and connected with such determinations is the direct weighing or measurement of the brain itself. Still another feature is the facial angle, i.e., the angle subtended by the bones of the face and forehead with the base of the cranium, viewed from the side (*norma lateralis*), or in vertical antero-posterior section (*norma mediana*). There are several modes of defining this angle, those of Camper, Cloquet, Jacquart, and Cuvier being best known; and the progressively increasing angle from the lower animals to the anthropoids, and thence from the lowest races to the highest type of humanity, is among the striking facts brought out by scientific inquiry. The facial index is another feature of modern anthropometry and affords arbitrary but useful means of comparing crania of different types, while craniometric specialists have devised a series of points, lines, and angles serving to define cranial forms and types in great detail. Among the applications of anthropometry, in what may be called the static aspect, are those involved in the Bertillon system (q.v.) and related methods of bodily description for identification or other purposes, and among these that of identification by finger-prints (i.e., by the patterns of the papillaceous ridges which are peculiar to each individual), which was brought out some years ago in America by Gilbert Thompson and in England by Francis Galton, and has come into general use in the identification of criminals. (The United States Indian service now requires all signatures of Indians to be accompanied by the finger-print).

During recent decades what may be called the dynamic aspect of anthropometry has attained prominence, and the measurement of structures has been supplemented by measurement of functions, both periodic and special. Among the former are rates of respiration and pulsation, which vary with sex, age, and race as well as with individual characteristics and conditions; and various devices (including the plethysmograph, with its variants and improvements) have been devised to measure the interrelations between the periodic and special functions of the human body. The latter functions are too numerous and variable for ready treatment, though athletic records, the military step in various armies, the hours of labor in different countries and classes, and other relevant material are

gradually assuming systematic form. Among the most fruitful lines of measurement of human function are those of experimental psychology, and education where, by use of the special statistical methods of Pearson, the functional relations between different kinds of activity may be discovered. The data obtained through anthropometry may be summarized under somatology (q.v.). See INDEX.

AN'THROPOMOR'PHISM (Gk. *ἄνθρωπος*, *anthrōpos*, man + *μορφή*, *morphē*, form). The application to God of terms which properly belong only to human beings. This may be done literally, teaching that God really has a body as some (see AUDÆUS) have been accused of doing, with doubtful truth. Some philosophers (Hobbes, Forster, Priestley) have ascribed to God a sort of subtle body. Figuratively, anthropomorphism is employed in the Scriptures, as when God is said to have eye or arm. Anthropomorphism ascribes to God human affections and passions and is the more common form of anthropomorphism. The whole tendency arises from the difficulty of conceiving of God as he is in himself, and from the teachings of Christianity, which seeks to reveal God to men and employs terms which are capable of being understood. While it is susceptible of abuse, it has a fundamental justification in the fact that if there is to be any knowledge of God at all, man must be assumed to possess a like nature with God. We are made "in his image." All early religion was strongly anthropomorphic. As it advanced, the gods became less like men in form, but a certain kinship of spirit must always exist, so long as there is any conception which could be called God. The extreme of recoil from anthropomorphism is found in those philosophers (e.g., Fichte and his school) who reject the personality of God as anthropomorphic. Schleiermacher, following Spinoza, thought that there was something in God far higher than personality, which he regarded as a human limitation.

AN'THROPOPH'AGY (Gk. *ἄνθρωπος*, *anthrōpos*, man + *φαγεῖν*, *phagein*, to eat). Cannibalism; the eating of human flesh. See CANNIBALISM.

ANTHU'RIMUM. See ARUM.

ANTHYL'LIS. See KIDNEY VETCH.

AN'TI, or **CAMPA.** An important and warlike tribe of Arawakan stock, occupying the forests at the head waters of the Ucayali River, the pampa of Sacramento, etc., on the eastern slope of the Andes, in southern Peru. The eastern division of the Inca Empire took its name of Antisuyu from them. They are of good physique and pleasant countenance and wear their hair long and flowing, with a poncho belted around the waist as their principal garment. The women are skillful weavers of wild cotton, and the men are good metal workers. They cultivate the ground to some extent and delight in taming animals from the forest. One of their important subtribes is the Machiganga, or Machiyenga, concerning which consult Farabee in *Proc. Amer. Antiq. Soc.*, vol. xx, N. S., pp. 127-131.

AN'TIA'RIA AND ANT'JAR. See UPAS.

ANTIBES, *än'téb'*. A fortified seaport in the department of Alpes-Maritimes, in the southeastern part of Provence, France, and the general port of communication with Corsica. It is 11 miles southwest of Nice, situated on the east side of a small neck of land called La Garoupe, lying west of the mouth of the Var, in a fertile

district (Map: France, S., M 5). The harbor is serviceable only for small craft. It possesses a naval school, and has considerable trade in olives, dried fruits, salt fish, oil, perfumery, etc. The anchovies prepared at Antibes are held in high esteem. The environs of the town are bright with vineyards and orchards, while its gardens of roses and jasmine furnish material for the extensive perfume manufactories of the town. There are a number of tobacco factories. Pop., 1896, 4956; commune, 9329; 1901, 5512; commune, 10,947; 1911, 12,198; commune, 21,414.

Antibes is very old, having been founded under the name of Antipolis by a colony of Greeks from Massila (Marseilles), of which it became a dependency. In the time of Augustus it was elevated to the rank of a *municipium* and must have attained a high degree of prosperity if we are to judge from the ruins of theatres and aqueducts that still exist. After the disintegration of the Roman Empire Antibes shared the fate of all cities in that region, becoming subject to successive tribes of barbarians from the North. In the ninth century it was destroyed by Saracens; in the sixteenth century it was fortified by Francis I and Henry IV; during the War of the Austrian Succession it sustained a siege of three months (1746), and gained some celebrity from having closed its gates against Napoleon on his return from Elba. Consult Vinson, "Le port et le quartier maritime d'Antibes," in *Revue Maritime*, vol. cxlvi (Paris, 1900).

AN'TIBURGH'ER. See BURGHER.

AN'TICANT, DR. PESSIMIST. An appellation of Thomas Carlyle (q.v.).

AN'TICHLOR (*anti* + *chlorine*). Any one of several substances (e.g., sodium sulphite, sodium bi-sulphite, sodium hyposulphite, or calcium sulphide) used by manufacturers of linen and cotton fibre and paper pulp to remove the last traces of free chlorine that had been generated from the hypochlorite used in bleaching the materials mentioned. Free chlorine has a tendency slowly to disintegrate the material unless removed.

AN'TICHRIST (Gk. Ἀντίχριστος, *Antichristos*; from ἀντί, *anti*, against + Χριστός, *Christos*, Christ). A name which occurs only in the Epistles of John, but which, in all likelihood, designates the final New Testament form of a popular belief, whose rise is to be found in later Judaism and which was appropriated with various modifications by biblical writers.

Its source is a question of much debate. Most probably, however, it lay in the popular convictions aroused by the constant announcement of the divine purpose to punish Israel's sin by giving her into the hands of heathen nations, but to recover her by force from their power when her spiritual discipline had been accomplished. The repeated carrying out of this policy, even in earlier Jewish history, evidently impressed the popular mind with the idea of an essential opposition between the heathen nations and the people of God, the final outcome of which was yet in the future, but must be in favor of the chosen people. Such an impression may have been aided by the instinctive natural beliefs in the struggle of darkness with light and chaos with order (Bousset); but, in view of the above unique line of revelation and experience peculiar to the Jewish people, it is quite gratuitous to make such general beliefs the definite source of such a distinctive popular conviction.

As the later revelation emphasized the element of punishment to be administered to the heathen nations by announcing that God would not only recover his people when their discipline was finished, but would chastise the nations for any attempt on their part to overreach the disciplinary mission given them, the popular idea of the hostility of the nations to the people of God was naturally increased. The primary form of this popular conception is evidently used by Ezekiel as a basis for his prophecy concerning the consummation of Israel's restoration, in which he describes the nations of the world as assembled under the leadership of "Gog of the land of Magog," for final battle against Israel (Ezek. xxxviii., xxxix.; see also Zech. xii. to xiv. where the prophet foretells the gathering together of all the nations of the earth to fight against Jerusalem, and the Lord's going forth in turn to fight against them).

In the experience of the Jews under Antiochus Epiphanes, however, the popular conception of this struggle made a distinct advance, in which the opposition was concentrated in a single personage, and all idea of disciplinary mission toward Israel was lost sight of in the conviction of an inherent enmity against the people of God. This secondary form appears in the eschatological prophecies of the Maccabean Book of Daniel (Dan. vii. to ix., xi., xii., in which are given the vision of the beast with the ten horns, triumphed over by the "Ancient of Days," and the vision of the goat with the horn between the eyes who warred against the holy city but was finally himself destroyed).

Naturally, as the idea of a personal Messiah increased in definiteness, this popular belief in a personal adversary would grow stronger, especially when we consider the long-continued influence on Jewish thought of the Daniel prophecies. We can believe, therefore, though the Jewish apocryphal literature antedating the Christian era does not distinctly show it, that the conception of an Antimesiah was more or less current in Judaism before the rise of Christianity. This Antimesianic conception is appropriated by New Testament writers, with modifications due to the newer revelations of truth in the Gospel and apostolic times, particularly those which substituted the spiritual for the national idea of the kingdom of God, and so emphasized the significant distinction between righteousness and sin. So we see Paul's statement concerning the advent and mission of the Man of Sin and his final destruction by Christ (2 Thess. ii. 1-12: "For the day of the Lord will not come, except . . . the Man of Sin be revealed, . . . who opposeth and exalteth himself against all that is called God . . . whom the Lord Jesus shall slay with the breath of his mouth . . . whose coming is according to the working of Satan with all power and signs and lying wonders . . . and deceit of unrighteousness"), where, however, in the deceiving character of his mission, there is brought out a new idea—an idea which is frequently applied by Paul to those who opposed him and his gospel (Acts xx. 30; 2 Cor. xi. 13; 1 Tim. iv. 1, 2). So also we see the various forms of statement in the Book of Revelation regarding the Beast and the Dragon (compare Rev. xi. to xiii., xvi., xix., xx., in which we are told of "the beast that cometh up out of the abyss," who overcomes "the two witnesses," and of the "red dragon having seven heads and ten horns," warring

against the woman and her child and destroyed by Michael and his angels; also of the "beast coming up out of the sea, having ten horns and seven heads," ministered to by the "beast coming out of the earth," with "two horns like unto a lamb," and finding his identification in the mystical number "six hundred and sixty and six"). The idea of the deceiving mission of the adversary, however, is in this book specifically pictured in the separate figure of the False Prophet, "who wrought signs wherewith he deceived them that had received the mark of the beast" (Rev. xvi. 13, xix. 20, xx. 10, though compare also xii. 9 and xiii. 14 for the same characteristics in the Dragon and the Beast). In this figure there is a return to the earlier personal idea of the Antimesiah, and, at the same time, an advance to the final New Testament form found in the Johannine Epistles, where the teaching of false doctrines is personified in the term Antichrist (1 John ii. 18, 22; iv. 1-3: "Many false prophets are gone out into the world . . . Every spirit which confesseth not Jesus . . . this is the spirit of Antichrist"; 2 John 7: "This is the deceiver and the Antichrist").

This Antimesianic conception is clearly appropriated by Jesus as a form for his eschatological statements regarding those who shall appear in opposition to his cause (Mark xiii. 5, 6; "Many shall come in my name, saying, 'I am he': and shall lead many astray"; see also verses 21, 22: "There shall arise false Christs and false prophets, and shall shew signs and wonders, that they may lead astray, if possible, the elect"). In these statements Jesus seems, in the term "false," to have distinctly introduced a new idea, which does not appear to have been present in the popular beliefs. This would, however, have been quickly intelligible to those of his hearers who recalled the false prophets of Jewish history, whose ability to deceive the false Christs were to reproduce. From the tradition of Jesus' words may have come the idea of falseness in Paul's statement regarding the Man of Sin and his own gospel opponents; from its definite form in the written gospel is quite certain to have come John's statement regarding the false prophet, if not his use of the term itself.

The idea of Antichrist persisted into the post-apostolic times, in both Jewish and Christian circles. In the former it returned to its earlier national form; in the latter it carried forward the final New Testament form of the teaching. Consult: H. Gunkel, *Schöpfung und Chaos* (Göttingen, 1895); W. Bousset, *The Antichrist Legend* (Eng. trans., London, 1896); Wadstein, *Die Eschatologische Ideengruppe-Antichrist-Weltsabbat-Weltende und Welgericht* (Leipzig, 1896); M. Friedländer, *Der Antichrist in den vorchristlichen jüdischen Quellen* (Göttingen, 1901). Consult also the Excursuses by Bornemann, Findlay, and Milligan, in their Commentaries on the Thessalonian Epistles; and the article on "Antichrist" in *Standard Bible Dictionary*.

ANTI-CIGARETTE LEAGUE. An organization founded in 1901 for combating by all legitimate means the use of cigarettes and other forms of tobacco by boys. It grew out of the work done along these lines for many years by Miss Lucy Page Gaston. The work of the league includes the introduction of anti-cigarette legislation in State legislatures and the circulation of pledges among boys. The stringent laws against the selling and smoking of cig-

arettes enacted in many States in recent years have been passed largely through the efforts of the league. Its organ, *The Boy Magazine*, is edited by Miss Gaston.

ANTICIPATION. In music. See HARMONY.

AN'TICLI'MAX (Gk. *ἀντί*, *anti*, against + *κλίμαξ*, *klimax*, a ladder, climax). In rhetoric, an abrupt declension by a writer or speaker from the dignity to which his idea has attained. Though the anticlimax is to be avoided in serious discourse, where it leads to bathos, it is employed with fine effect in ridicule and satire. Pope, Addison, and Fielding were masters in this art of unexpected descent. Pope, for example, thus writes of Queen Anne at Hampton Court:

"Here thou, great Anna whom three realms obey,
Dost sometimes counsel take—and sometimes tea."

AN'TICLI'NAL AX'IS. See ANTICLINE.

AN'TICLINE (Gk. *ἀντί*, *anti*, against, opposite + *κλίνειν*, *klinein*, to incline). In geology, a term applied to that form of rock-folding in which the opposite sides or limbs of the fold slope downward and away from the crest of the fold. Anticlinal axis is the axis or crest of such a fold. The anticline may be compared to the ordinary gable roof—the axis corresponding to the ridge of the roof, while the limbs of the anticline correspond to the slopes of the roof. When the anticlinal axis lies in a horizontal plane, which, however, is seldom the case, the layers composing the limbs of the fold are, after erosion, exposed in parallel rows on either side of the axis; those layers of earlier age, and consequently of lower stratigraphic position, occupying positions nearer to the axis, and vice versa. Thus, in an anticlinal ridge the crest of the ridge is occupied by rocks of a geologic age earlier than that of the rocks forming the flanks of the ridge. A special case of anticlinal structure is represented by the dome in which the strata slope away in all directions from a central point or summit.

The supplementary condition to that of the anticline or up-fold, is observed in the *syncline*, or down-fold, and indeed these two types of folds are usually found in close association; the features of anticlines being, however, reversed in synclines. When anticlinal and synclinal axes are tilted and eroded, the component layers outcrop in alternating convergent and divergent series to form zigzag ridges with intervening "canoe-valleys," a type of structure which is well developed in Pennsylvania. The term *anticlinorium* is applied to a compound anticline, and the term *synclinorium* to a compound syncline. Anticlines are sometimes associated with the occurrence of natural gas, it having been demonstrated that the gas occurs at those portions of the gas-bearing stratum that have been thrust upward to form an anticlinal axis or dome. See DIASTROPHISM; GEOLOGY; and for illustration, see Plate accompanying the latter title.

AN'TICOS'TI (N. Amer. Ind. *Naticotck*). A barren island in the province of Quebec, Canada, dividing the Gulf of St. Lawrence into two channels and situated between lat. 49° and 50° N. and long. 61° 40' and 64° 30' W., 40 miles north of Cape Gaspé (Map: Canada, S 7). It is 135 miles long, with a maximum width of 40 miles; has an area of 3147 square miles. It is almost destitute of harbors, the north shore being mountainous, and the south low and beset with shoals, while the neighbor-

ing currents are capricious. Ellis Bay, to the west, and Fox Bay, in the northwest, are the only possible harbors. The climate is severe, while the surface is an alternation of rocks and swamps. The principal inhabitants are the keepers of the lighthouses situated at different parts of the coast. Pop., about 250. There is little good timber, and agriculture cannot be carried on to any great extent because of prevalent summer frosts. Near the island there are considerable salmon, trout, cod, and herring fisheries. It is a favorite resort for seal and bear hunters. The most extensive peat deposits in the Dominion are found here. Marl exists in most of the small lakes and ponds along the coast. In 1873 the island was divided into 20 counties by a land company and was the scene of a disastrous colonization scheme. The colonists were attracted by specious promises, and had to be removed to the mainland after suffering severe privations. In 1895 Anticosti was acquired as a game preserve by M. Menier, a Parisian manufacturer. The rocks of Anticosti are of great interest to the geologist, as they comprise a series of shale and limestone beds that constitute an uninterrupted transition formation between the Ordovician and Silurian systems such as is known in few other localities. Consult: Logan, *Geological Survey of Canada, Report of Progress from its Commencement to 1863*, with atlas (Montreal, 1863-65); Billings, "Catalogue of the Silurian Fossils of Anticosti," *Geological Survey of Canada* (Montreal, 1866). See SILURIAN SYSTEM.

AN'TICY'CLONE. See STORM.

ANTICYRA, ān-tīs'ī-rā (Gk. Ἀντίκυρα). A city of Phocis (q.v.), on the Corinthian Gulf, with an excellent harbor. It was famous for the hellebore which grew in the neighborhood and so was much visited by the sick. The modern town is Aspra Spitia. There were two other towns called Anticyra, one in Locris and one in Malis.

AN'TIDOTE (Gk. ἀντίδοτος, *antidotos*, given against, from ἀντί, *anti*, against + δίδωμι, *didonai*, to give). A term applied in medicine to any substance capable of neutralizing the action of a poison. The action of antidotes may be due either to their chemical properties or to their having physiological effects that are the opposite of those which they are intended to counteract. Acids and alkalies are an example of chemical antidotes. Morphine and atropine are typical examples of physiological "antagonism." In cases of poisoning in which no true antidote is known, the treatment resorted to is necessarily of a mechanical nature. Such cases are in the majority; so that the stomach pump, emetics, and purgatives play an important rôle in the treatment of most cases of poisoning. The following is a list of the ordinary poisons, with their antidotes and other measures employed in counteracting them.

Acetanilid, Antipyrin, Phenacetin (ingredients of Headache Powders).—The patient should be kept warm, and heart stimulants, such as strychnine, digitalis, or whisky be administered.

Acids, Vegetable; Acetic, Oxalic, Tartaric Acids.—Give the patient water containing a suspension of such alkaline substances as chalk, whiting, or, in emergency, plaster scraped from the wall. Then give a dose of castor oil or of Epsom salts.

Acids, Mineral; Nitric, Sulphuric, Hydrochloric Acids.—Give chalk, magnesia, or soap, followed

by demulcent drinks, such as the white of egg.

Alcohol.—The stomach may be emptied by an emetic or a stomach pump, and this followed by such stimulants as aromatic spirits of ammonia or hot coffee in repeated doses until the pulse has become strong. Then cold should be applied to the head and heat to the extremities.

Arsenic, Paris Green, "Rough-on-Rats."—A tablespoonful of "dialyzed iron" (sold in all drug stores) should be given to the patient every half-hour for four doses. This should be followed by a dose of castor oil.

Carbolic Acid.—A good chemical antidote for this is Epsom salts (magnesium sulphate) or any other soluble sulphate; for, on entering the blood, these form with carbolic acid harmless chemical compounds. Give the patient also large amounts of sweet oil, white of egg, and stimulants. Diluted alcohol is a valuable local antidote if given almost immediately after the poison is taken.

Carbonic Acid Gas, Carbonic Oxide, Coal Gas.—Fresh air should be supplied, artificial respiration employed, 30 drops of aromatic spirits of ammonia given every half-hour for three doses, and then one ounce of well-diluted whisky every three hours, for three doses.

Chloral, "Knock-out-drops."—Thirty grains of ipecac in water should be given to the patient as an emetic, followed by a hypodermatic injection of one-twentieth of a grain of strychnine. Friction of the surface, application of warmth, and artificial respiration are effective.

Corrosive Sublimate (Bichloride of Mercury), *Bed Bug Poison, White Precipitate.*—Thirty grains of powdered ipecac in warm water should be given to the patient as an emetic, then the whites of a dozen eggs, and a hypodermatic injection of morphine.

Iodine.—After evacuating the stomach administer starch suspended in water, followed by a dose of morphine hypodermatically, and inhalations of ammonia.

Nicotine, Tobacco.—The patient should be placed flat on the back, and emetics and stimulants should be administered. A hypodermatic injection of one-fortieth of a grain of nitrate of strychnine has a very good effect.

Opium, Morphine.—An emetic or the stomach pump should be employed first of all; then the patient should be made to inhale ammonia, and half a grain of permanganate of potash should be given every hour. Artificial respiration should be employed, two ounces of hot black coffee may be injected into the rectum, and rubbing and gentle shaking or brisk flagellation should be employed to keep the patient awake. A subcutaneous injection of atropine, or 30 drops of tincture belladonna given through the mouth, will have a powerful counteracting effect by stimulating the respiratory centre.

Prussic Acid.—Usually so rapidly fatal that nothing can be done, but when possible the stomach should be washed out, diluted ammonia given by the mouth with a dose of opium to relieve the pain. Then alternating hot and cold douches, atropine and heart stimulants by hypodermatic injection and artificial respiration.

Plomaine Poisoning by putrefied meat or sausage (botulism).—Evacuate and wash out the stomach. Morphine is given to counteract the abdominal pain, and when there is prostration, stimulants.

Strychnine.—The stomach pump should be employed as early as possible, and 20 grains of zinc sulphate should be given, or 30 grains of powdered ipecac, in warm water, as an emetic. Then 20 grains of chloral and 30 grains of bromide of sodium, dissolved together in two ounces of hot water, may be injected into the rectum. In case convulsions occur, they may have to be controlled by the inhalation of chloroform. Chloral, which is in a sense antagonistic to strychnine, is considered a valuable antidote. In any case, 20 grains of sodium bromide should be given by the mouth every hour.

Tansy.—Thirty grains of powdered ipecac in warm water as an emetic, and a dose of castor oil, should be given to the patient.

Turpentine.—An emetic, mucilage of gum arabic, Epsom salts, and a hypodermatic injection of morphine, are indicated.

In the case of unknown poisons it is advisable to give two teaspoonfuls of chalk mixed with water, four eggs beaten up in a glass of milk, and some whisky. The stomach pump, too, may be useful, and in case these measures give no relief, artificial respiration should be employed. Of course, the physician should endeavor to ascertain the nature of the poison and direct the treatment accordingly.

AN'TI-EMET'IC (Gk. *ἀντί*, *anti*, against + *ἔμειν*, *emein*, to vomit). Any remedy which tends to arrest nausea and vomiting. No class of drugs is more unreliable in action, and rest and quiet are at times much more efficient than the administration of an anti-emetic. Drugs may act upon the vomiting centre, as morphine or hydrocyanic acid, or on the nervous system, or locally on the stomach. Of the local remedies, external applications of counter-irritants or of cold may succeed. Emetics act by removing the cause for continued vomiting; lavage, or washing the stomach, in the same way. Cold carbonated waters, alcohol, especially dry champagne, chloroform, opium, bromides, chloral hydrate, and arsenic are at times used successfully. Dilute hydrocyanic acid, small doses of calomel, cerium oxalate, cocaine, carbolic acid, nuxvomica, and the alkalis are among the most reliable anti-emetics. In any case, it is necessary to determine the cause of vomiting before it is possible to select a proper anti-emetic. For example, the gastric disturbance may result from excessive acidity of the stomach contents, when an alkali or simple dilution with water may give relief; or it may be of cerebral origin, in which case such drugs as the bromides or opium may be required. If due to gastric irritation, a local anæsthetic may be efficacious; if to chronic alcoholism, some form of astringent, bitter, or stimulant, may relieve the vomiting. See EMETIC.

ANTIETAM, *ān-tē'tam*, BATTLE OF, sometimes called THE BATTLE OF SHARPSBURG. A sanguinary conflict fought on Sept. 16 and 17, 1862, between a Federal force of about 75,000 under General McClellan and a Confederate force of about 40,000 under General Lee. After having driven McClellan from the Peninsula and Pope from the Rappahannock back upon Washington, Lee took the offensive and crossed the Potomac, with the intention of invading Pennsylvania, and with hopes of inducing Maryland to join the Confederate cause, and possibly of forcing a satisfactory peace upon the Federal government. Dividing his army, he sent Jackson

with 12,500 men on September 15. Meanwhile, on McClellan's advance from Washington, Lee took up a strong position at Sharpsburg, on the west side of Antietam Creek and fortified the passes of South Mountain. These McClellan forced on the 14th (see SOUTH MOUNTAIN, BATTLE OF), and on the 15th the two armies stood facing each other across the Antietam. McClellan delayed his attack, and a part of Jackson's forces rejoined Lee; but on the afternoon of the 16th the Federal commander ordered Hooker across the creek, where the latter skirmished until dark. On the morning of the 17th



the Federal right and centre, under Generals Hooker, Mansfield, and Sumner, though their attacks were badly concerted, forced back the Confederate left under Jackson, who had arrived from Harper's Ferry during the night of the 16th; while the Federal left, under Burnside, which had been unable to cross the creek until 1 p.m. owing to the stubborn opposition of the Confederates at "Burnside's Bridge," attacked at 3 p.m. the Confederate right under Gen. A. P. Hill, and fought stubbornly until dark without obtaining any decisive advantage. McClellan decided not to renew the battle on the following day, though the Confederate right made several assaults upon Burnside's position, and during the night of the 18th General Lee retreated unmolested across the Potomac. The Federals lost in killed, wounded, and missing about 12,500, and the Confederates about 11,000. It was one of the bloodiest battles of the Civil War, more men being killed on September 17 than on any other one day between 1861 and 1865. Tactically, it was a drawn battle, though military critics are almost unanimous in the verdict, that McClellan, who brought only a part of his force into action, made many grave blunders, while the generalship of Lee, who utilized nearly every man, was almost faultless. Strategically, however, it was an important Federal victory, since it forced Lee to abandon his aggressive

campaign and retreat into Virginia. "Without McClellan's victory," says Rhodes, "the emancipation proclamation would have been postponed and might never have been issued." Consult: *Battles and Leaders of the Civil War* (4 vols., New York, 1887); Ropes, *Story of the Civil War* (2 vols., New York, 1894-98); *McClellan's Own Story* (New York, 1887); Michie, *General McClellan* (New York, 1901); Heysinger, *Antietam and the Maryland and Virginia Campaigns of 1862* (New York, 1912).

ANTIFEB'RIN. See ACETANILID.

AN'TI-FED'ERALISTS. A political party in the United States opposed to the so-called Federalists. As a matter of theory and analysis, the Federalists believed in a national system of government, while the Anti-Federalists believed in a decentralized and strictly federal system of government. The Federalists had the advantages of possessing a positive programme, and of gaining the first two points in the conflict when the national constitution was adopted and when they committed the national government to the exercise of such extensive powers as the creation of a national bank. The Anti-Federalists were thus merely a party of political opposition to the party in power. When, however, the Federalists, in the Alien and Sedition Acts (q.v.), seemed to encroach both upon the liberty of the individual and upon the jurisdiction of the States, the opposition of the Anti-Federalists became acute and their fundamental propositions were stated in the Virginia and Kentucky Resolutions (q.v.). This crisis resulted in the triumph of the Anti-Federalists under the leadership of Jefferson in the election of 1800; but soon thereafter the leaders of the party began to abandon its original creed of the strict interpretation of the Constitution and the narrow limitation of the powers of the national government. The first step in this direction was the purchase of Louisiana; and when finally the Federalist party was driven entirely out of existence, its characteristic principles remained effective as the chief principles of the Anti-Federalist party. The party was named the Republican party, then Democratic-Republican, and finally Democratic party. The name Anti-Federalist is commonly applied to the opponents of the party in power up to the end of the Adams administration. Strictly speaking, this is not correct, and the name should be limited to the campaign for the adoption of the Constitution. The Anti-Federalists opposed the adoption. Their objections were largely met by the first 10 amendments which were soon added to the Constitution. This was the party's chief contribution to American history. Consult Ostrogorski, *Democracy*, vol. ii (New York, 1902); and see DEMOCRATIC PARTY; FEDERALISTS; REPUBLICAN PARTY; UNITED STATES.

AN'TIGO. A city and the county-seat of Langlade Co., Wis., on the Spring Brook River, and on the Chicago and Northwestern Railroad, 207 miles by rail northwest of Milwaukee (Map: Wisconsin, D 3). The most noteworthy features are a teachers' training school, a school for the blind, a school of chiropractics, a business college, and a Carnegie library. It is in a productive agricultural and timber region, of which it is the commercial centre, and has extensive dairying interests and manufactures of various kinds of woodenware, besides flour mills, breweries, saw mills, cigar factories, wagon works,

foundries, railroad shops, etc. Settled about 1878, Antigo was incorporated in 1884. The government is administered under a general State law, which provides for a mayor biennially elected, and a municipal council. Altitude, 900 feet. Pop., 1880, 4424; 1900, 5145; 1910, 7196.

ANTIGONE, ān-tīg'ō-nē (Gk. Ἀντιγόνη).

1. In the Theban legend, daughter of Œdipus (q.v.) by his mother, Jocasta, and sister of Eteocles, Polynices, and Ismene. Her story existed in various forms. The Athenian dramatists represented her as accompanying her blind father, Œdipus, in his exile, until his mysterious death or disappearance at Colonus in Attica. When her brother Polynices led the Seven against Thebes, she was in the city, and after the mortal duel between Eteocles (q.v.) and Polynices, she disregarded the decree of Creon, that the latter should be left unburied. Caught in the act of burying her brother by throwing the three handfuls of dust upon his body, she was condemned to be immured in a tomb, where she hanged herself. Her betrothed, Hæmon, son of Creon, committed suicide. Antigone's filial and sisterly devotion are depicted by Sophocles (q.v.) in the *Œdipus at Colonus* and in the *Antigone*. She appears in Æschylus's *Seven Against Thebes* and in Euripides's *Phœnissæ*. She was also the subject of a lost play of Euripides, which seemingly ended with her marriage to Hæmon. 2. ANTIGONE, daughter of Eurytius, and wife of Peleus, who hanged herself upon hearing a false report of her husband's marriage to Sterope, daughter of Acastus. 3. ANTIGONE, daughter of Laomedon, and sister of Priam, who offended Hera by comparing her own beauty to that of the goddess. Hera turned her hair into snakes, which so tormented her that the gods, in compassion, changed her into a stork.

ANTIG'ONUS (Gk. Ἀντίγονος, *Antigonos*), called Cyclops, or the 'One-Eyed' (c.380-301 B.C.). One of the generals of Alexander the Great, and a member of a distinguished Macedonian family. His father's name was Philip, though whether this was Philip of Elymiotis is uncertain. When Alexander died and his Empire was divided (323 B.C.), Antigonus received the provinces of Greater Phrygia, Lycia, and Pamphylia. Being accused of disobedience by Perdiccas, who was aiming at sole control of the lands left by Alexander, he entered into an alliance with Craterus, Antipater, and Ptolemy, and made war on Perdiccas. Perdiccas soon died, but the war was prosecuted against Eumenes and the party of Perdiccas. After the death of Antipater, in 319 B.C., Antigonus began to carry out his plans for obtaining sole sovereignty of Asia. The resultant war was continued with varying success, and many alliances were made and broken. At one time during the long struggle Antigonus was supreme in Asia and assumed the name of king. He himself invaded Egypt, and his son Demetrius Polioretetes carried the war into Greece, but both were compelled to withdraw again to Asia. In 301 B.C. the forces of Antigonus and Demetrius Polioretetes were overwhelmed by Lysimachus and Seleucus at Ipsus, in Phrygia, and Antigonus was killed.

ANTIGONUS (Gk. Ἀντίγονος, *Antigonos*). A Maccabee, King of the Jews, son of Aristobolus II, and the last of the Hasmonean dynasty. In 63 he was taken prisoner by Pompey and sent to Rome; later he escaped. In 56 he was again a prisoner in Rome, but was set free by

the Senate. After the death of the great Antipater, he sought to gain the throne, and about 40 B.C., with the help of the Parthians, who were then, under Pacorus, raiding Syria, he drove Herod from Jerusalem and assumed the royal power and became high priest. Herod fled to Rome, and was proclaimed there by the Senate King of the Jews; with the aid of Octavius and Antony, he returned in 37 B.C. to regain the throne. In the meantime the Parthians had been defeated by Ventidius and driven out of Syria. Antigonus surrendered to Sossius, representative of Antonius. He was taken to Antioch and, at the request of Herod, was there put to death in the same year. See **MACCABEES**.

ANTIGONUS DO'SON (?-220 B.C.). A king of Macedonia, from 229 to 220 B.C., called Dason (Gk. Δώσων, about to give), it is said, because he was "always about to give and never did." He was the grandson of Demetrius Poliorcetes, and on the death of Demetrius II of Macedonia became guardian of the latter's son Philip. He himself, however, married the widow of Demetrius and became king. He sided with the Achæan League against the Spartans, whom, under King Cleomenes, he defeated at Sellasia in 221.

ANTIGONUS GONATAS (319-239 B.C.). A son of King Demetrius Poliorcetes of Macedonia, and grandson of the great Antigonus. On his father's death, 283 B.C., he took the title of king, but, since there were various claimants to the throne, he did not secure the full power until 276 B.C. He was twice expelled from his dominions by a hostile force from Epirus, under Pyrrhus (before 277 and in 273). Consult W. W. Tarn, *Antigonus Gonatas* (Oxford, 1913).

ANTIGONUS OF CARYS'TOS. A Greek sculptor and author. He lived at Athens and Pergamum about the middle of the third century B.C. He worked at Pergamum on the group of bronze statues intended to picture the victory of the Pergamene kings over the Gauls. See **PERGAMON**.) Beside several biographies of celebrated contemporary philosophers, of which large fragments are preserved by Athenæus and Diogenes Laertius, he wrote treatises on painting and the plastic arts. Consult Westermann's *Scriptores Rerum Mirabilium Græci* (Brunswick, 1839), and the first volume of Keller's *Rerum Naturalium Scriptores Græci Minores* (Leipzig, 1877); Ulrich von Wilamowitz-Moellendorf, "Antigonus von Karystos," in his *Philologische Untersuchungen*, iv.

ANTIGONUS OF SO'KO. A Jewish teacher who, according to Pirke Aboth, iii, the only passage in the Mishna referring to him, handed down the tradition from Simon the Just, and expressed the following sentiment: "Be not like slaves who serve their master for their daily food; be like those who serve their master without considering the reward, and let the fear of God be with you." As to the time when he lived, the teachers of Simeon ben Shetach, a contemporary of Alexander Jannæus (102-76 B.C.) are said to have derived the tradition from his disciples, so that he probably appeared early in the second century B.C. Concerning Simeon the Just little is known with certainty (compare Schmidt, *Ecclesiasticus*, 1903, pp. xxiii ff.). Soko, the modern *el Suweke*, lies southwest of Jerusalem near Bet Jibrin, the old Eleutheropolis. A Greek name for a Jew is not strange at this time and in this environment, but the sentence quoted does not necessarily indicate

the influence of Greek thought. It represents a legitimate development of the teaching of the prophets. There is no evidence that he was a member of the Pharisaic party or that this sect existed in his time. Consult Schürer, *Geschichte d. jüdischen Volkes*, 4th ed., vol. ii, p. 420.

ANTIGUA, an-tē'gā or -gwā. One of the British West Indian Islands, situated in lat. 17° 6' N. and long. 61° 45' W., forming with Barbuda and Redonda the most important of the five presidencies of the Leeward group (Map: West Indies, G 3). It covers an area of 108 square miles and had a population of 38,899 in 1911, chiefly negroes. The surface is rugged, and the coasts are highly indented and surrounded with rocks and shoals. The soil is very fertile, especially in the interior, but scarcity of water on the island necessitates the construction of reservoirs and irrigation works. The chief products are sugar, cotton, and pineapples. Commerce declined somewhat owing to the competition of countries paying a bounty on sugar, but latest figures show a new advance. Following is a table of exports and imports in pounds sterling:

Year	Exports	Imports
1898	79,178	105,103
1900	111,849	125,304
1903	110,036	136,147
1907-08	172,410	164,587
1908-09	179,106	175,587
1909-10	114,122	139,496
1910-11	196,184	170,033
1911-12	164,813	187,688

The island suffered severely from the hurricane of August, 1899. Antigua was discovered by Columbus in 1493 and was settled by the British in 1632. Slavery was abolished in 1834. It is the seat of the government of the colony, which consists of an executive council and a legislative council made up of eight official and eight unofficial members, both branches presided over by the Governor. The capital is St. John, with a population of 9262. It has a fine harbor, although English Harbor, on the south coast, is the best port. Consult V. L. Oliver, *History of Antigua* (London, 1894-99).

AN'TI-ÏMPE'RIALIST LEAGUE. An organization founded in 1898, after the conclusion of the Spanish-American War, to oppose the forcible extension of the authority of the United States over foreign peoples. Its work has been chiefly directed towards the immediate independence of the Philippine Islands. The propaganda of the league, carried on by the circulation of pamphlets and circulars, has been forcible and at times bitter. It has combated the American administration of the Philippines since their acquisition by the United States, and has criticised the methods of government with great freedom. The league has its chief membership in New England. Its work has undoubtedly done much to encourage among the Filipinos the idea of immediate independence.

AN'TI-JAC'OBIN, or **WEEK'LY EXAM'INER**, THE. An English paper published from Nov. 20, 1797, to July 9, 1798. It was founded by George Canning and his friends to express their opposition to the principles of the French Revolution. Its editor was William Gifford, who had already made a reputation as a political satirist. Among its contributors, besides Canning, were J. H. Frere and George Ellis.

ANTI-JACOBIN REVIEW', THE. An English periodical founded by John Gifford in 1798 after the discontinuance of the foregoing, i.e., *Anti-Jacobin, or Weekly Examiner*, with which, however, it had nothing to do. Its full title was *The Anti-Jacobin Review and Magazine, or Monthly Political and Literary Censor*. It ceased to appear in 1821.

ANTI-KOKA'NIA. A fossil genus that includes the earliest representatives of life found anywhere up to the present time. The fossils were uncovered by A. C. Lawson in the vicinity of Steeprock Lake, west of Port Arthur, Canada, in strata of supposedly Lower Huronian age, and were described by Walcott in 1912, who placed them in this new genus. They are very primitive forms, built up of a number of tubes which in some instances are of hexagonal cross-section, and having a globose, radiating, or pear-shaped outline. They appear to be ancestral to the sponges, but also show relationship with the corals.

AN'TILEGOM'ENA (Gk. spoken against, from *ἀντί*, *anti*, against + *λέγειν*, *legein*, to speak). A term applied by Eusebius in his *Ecclesiastical History*, iii, 25, to certain New Testament books which were not, in his day, *homologoumena* (*ὁμολογούμενα*), i.e., everywhere acknowledged as authentic and authoritative. There were seven such books, viz., James, 2 Peter, Jude, 2 and 3 John, Hebrews, and the Revelation of John.

AN'TI-LIB'ANUS, or AN'TI-LEB'ANON (Gk. *Ἀντιλίβανος*, *Antilibanos*, Counter Lebanon). A mountain ridge in Palestine and Syria, about 90 miles long, separated from the Lebanon range on the west by the valley of Cœle-Syria (Map: Turkey in Asia, G 5). It is generally inferior to the Lebanon, its highest peak, Mount Hermon, on the southeast, being only a little over 9000 feet in height. This mountain is covered with perpetual snow and gives rise to the river Jordan. The Anti-Libanus is composed of Cretaceous strata and is almost devoid of cedars. Besides Mount Hermon the highest peaks are Tala-at-Musa (8721 feet), Halimat-Kabu (8257 feet), and Abul-Hin (8330 feet).

ANTILLES, *Eng.* *ān-til'lēz*; *Fr.* *ān'tēl'*. A name applied to the West India Islands exclusive of the Bahamas. (See map.) The total area is about 90,000 square miles. The Antilles are generally divided into the Greater and Lesser Antilles. The former comprise the four largest islands, Cuba, Jamaica, Haiti, and Porto Rico, and a few small islands near their coasts. The Lesser Antilles are composed of a chain of small islands which, starting with St. Thomas, extends in the form of a crescent, and includes the Leeward and Windward groups, and all the small islands along the northern coast of Venezuela. Some authorities exclude the Virgin Islands from the Leeward group, thereby making four divisions instead of three. For detailed information, see articles on the groups and separate islands; also article on WEST INDIES.

AN'TILOCA'PRA AMERICANA (*Antelope* + Lat. *capra*, a she-goat). The type genus of the North American ruminant family Antilocapridæ, represented by the pronghorn, characterized by the absence of lateral hoofs, and especially by the fact that the horns, compressed at the base, are branched and deciduous. See PRONGHORN. See Colored Plate of ANTELOPES.

ANTIL'OCHUS (Gk. *Ἀντίλοχος*). Son of Nestor, who died young.

AN'TILOG'ARITHM. See LOGARITHM.

ANTI-MACHIAVEL, *ān'tī-māk'ī-ā-vēl.* A treatise written by Frederick the Great before he came to the throne; published by Voltaire in 1740. It is a reply to Machiavelli's *Prince* and sets forth the obligations of rulers.

ANTIMACHUS, *ān-tīm'ā-kūs* (Gk. *Ἀντίμαχος*, *Antimachos*). A Greek poet and critic of Colophon, who lived about 410 B.C. He was a contemporary of Plato and a forerunner of the poets of the Alexandrine school. His works were more remarkable for learning than for genius. His chief productions were *Lyde*, a cycle of elegies, dealing with his lost love Lyde, which was imitated by Hermesianax, of Colophon, in his *Leontion*; an epic poem, *Thebais*, which the Alexandrine critics thought worthy to be compared with Homer's *Iliad*, but of which now only scanty fragments remain; and a recension of the text of the Homeric poems, from which readings are given in the Homeric Scholia. He was held in high esteem and exercised a great influence on later poets. In the few extant fragments of his works his style, though learned, is rigid and artificial. Consult Kinkel's edition of the *Thebais*, in the *Epicorum Græcorum Fragmenta*, vol. i (Leipzig, 1877), and Bergk's edition of *Lyde*, in *Poetæ Lyrici Græci* (4th ed., Leipzig, 1882).

AN'TI-MA'NSONS. The name of a political party in New York and other states, organized in 1827-28, chiefly as the result of excitement over the fate of William Morgan, of Batavia, N. Y., who was said to be about to publish, or betray, the secrets of the Masonic order, of which he was a member. He disappeared suddenly in 1826, and his fate has never been satisfactorily determined. The opponents of Freemasonry declared that he had been murdered and his body sunk in the river or lake at Niagara. Legal inquiries followed, but proved nothing. At or about that time the Governor of the State was a Mason of the most advanced degrees, and probably a majority of all public officers were members of the order. Widespread excitement pervaded western New York, and the Anti-Masonic party was formed, casting in that State alone 33,000 votes in 1828, about 70,000 in 1829, and 120,000 in 1830, though many in the latter year were anti-Jackson men, without reference to Masonry. The party attempted to organize on national lines in 1830, and especially in connection with its National Convention of 1831; and in 1832 it supported William Wirt for President, but carried only one State, Vermont. The party was also able, through the disorganization of the Democrats, to control temporarily Pennsylvania, and it was strong in Ohio and Massachusetts; but after 1835 it disappeared as rapidly as it had arisen. Many who were conspicuous later in the two chief parties, such as Thurlow Weed, Seward, and Millard Fillmore, first entered politics in the ranks of the Anti-Masons. Upon the coalescence of each of the dominant parties, the life of a third national party became an impossibility, especially upon the subsidence of the excitement out of which it had arisen. That the opposition to Masonry simply served as an issue around which centred several discontented elements is shown by the fact that William Wirt was a Mason and defended the order before the convention which nominated him. Consult: Hammond, *Political History of New York State* (Cooperstown, 1846); Alexander, *Political History of the State of New York* (2 vols., New

York, 1906): McCarthy, "The Antimasonic Party," in the *Report of the American Historical Association for 1902* (Washington, 1903).

ANTIMONAN, ä'n'tê-mô-nän'. A seaport town of Luzon, Philippine Islands, in the province of Tayabas (Map: Luzon, J 11). It is situated on the eastern coast, 19 miles east of Tayabat, opposite Alabat Island, on which there are veins of excellent coral. Pop., 1903, 11,203.

AN'TIMO'NIAL WINE. See TARTAR EMETIC.

AN'TI-MONOP'OLY PAR'TY, THE. A political party organized at Chicago on May 14, 1884, when it nominated Benjamin F. Butler, of Massachusetts, for the presidency, on a platform which demanded an Inter-State Commerce law, a direct vote for United States Senators, a graduated income tax, the establishment of labor unions, the repeal of all tariffs, and the prohibition of grants of land to corporations. In the ensuing election the party united with the Greenback Labor party, the combined vote reaching 130,000 in the election of 1884.

AN'TIMONY (LL. *antimonium*, of disputed origin). One of the well-known metallic elements. It was known to the ancients, but first isolated in 1450. It occurs native in small quantities, occasionally with silver, iron, or arsenic. The chief commercial source is stibnite (gray antimony ore), containing 71.77 per cent of antimony and 28.23 per cent of sulphur, which is found in France, Spain, Germany, Italy, Austria, New South Wales, and Japan. The commercial production of stibnite ceased in the United States in 1907 owing to the low price of metal. The chief source of antimony in the United States, however, is a by-product obtained in smelting antimonial lead-ores, which yields a 'hard' or antimonial lead containing upward of 25 per cent of antimony. The production during 1911 consisted of 1543 tons from domestic and 711 tons from foreign antimonial lead ores. From alloys, scrap metal, and dross the production amounted to 2369 tons. The imports into the United States of type metal during the same period amounted to 4195 tons and contained 17.3 per cent of antimony. The metal is obtained from the ore in two ways: 1. Roasting the sulphide to form volatile oxide which is collected and subsequently reduced in furnaces or crucibles with carbon under a cover of fusible slag in order to prevent the oxidation of the molten reduced metal. 2. Precipitating molten antimony sulphide in a crucible by metallic iron and salt or sodium sulphate forming metallic antimony and a fusible iron-sodium sulphide; the product after refining contains between 98 and 99 per cent of antimony.

Antimony (symbol Sb., at. wgt. 120.43) is a brittle, hard, silver-white metal, easily crystallized, has a specific gravity of from 6.6 to 6.8, melts between 440° and 450° C., boils between 1090° and 1450° C. The chief commercial use of antimony is as a constituent of alloys. With acids antimony forms two classes of salts—antimonious and antimonic—in which the element is trivalent and quinquivalent respectively. The more important compounds of antimony are: the trisulphide, used in medicine and as a brilliant red pigment in oil painting, also in the manufacture of safety matches, percussion caps, fireworks, and yellow pigments; the pentasulphide, a red pigment used for coloring and vulcanizing rubber, or the trichloride, "butter of antimony," used as a bronzing solu-

tion for gun-barrels; the trioxide, used in the preparation of tartar emetic, and as a mordant.

ANTIN, MARY. See GRABAU, MARY ANTIN.

AN'TINO'MIANISM (Gk. *ἀντί*, *anti*, against + *νόμος*, *nomos*, law). The doctrine or opinion that Christians are freed from obligation to keep the law of God. It is generally regarded by the advocates of the doctrine of justification by faith as a monstrous abuse and perversion of that doctrine, upon which it usually professes to be based. From several passages of the New Testament, as Rom. vi. and 2 Peter ii. 18, 19, it would seem that a tendency to antinomianism had manifested itself even in the apostolic age; and many of the Gnostic sects were really antinomian, as were probably also some of the heretical sects of the Middle Ages; but the term was first used at the time of the Reformation, when it was applied by Luther to the opinions advocated by Johann Agricola (q.v.). Agricola had adopted the principles of the Reformation; but in 1527 he found fault with Melancthon for recommending the use of the law, and particularly of the Ten Commandments, in order to produce conviction and repentance, which he deemed inconsistent with the Gospel. Ten years after, he maintained, in a disputation at Wittenberg, that as men are justified simply by the Gospel, the law is in no way necessary for justification nor for sanctification. The "Antinomian Controversy" of this time, in which Luther took a very active part, terminated in 1540 in a retractation by Agricola; but views more extreme than his were afterward advocated by some of the English sectaries of the period of the Commonwealth; and, without being formally professed by a distinct sect, antinomianism has been from time to time reproduced with various modifications. It ought, however, to be borne in mind that the term "antinomianism" has no reference to the conduct, but only to the opinions of men; so that men who practically disregard and violate the known law of God are not therefore antinomians; and it is certain enough that men really holding opinions more or less antinomian have in many cases been men of moral life. It is also to be observed that the term "antinomianism" has been applied to opinions differing very much from each other. In its most extreme sense it denotes the rejection of the moral law as no longer binding upon Christians, and a power or privilege is asserted for the saints to do what they please without prejudice to their sanctity, it being maintained that to them nothing is sinful; and this is represented as the perfection of Christian liberty. But besides this extreme antinomianism, than which nothing can be more repugnant to Christianity, there is also sometimes designated by this term the opinion of those who refuse to see in the Bible any positive laws binding upon Christians, and regard them as left to the guidance of Gospel principles and the constraint of Christian love; an opinion which, whatever may be thought of its tendency, is certainly not to be deemed of the same character with the other. Probably this kind of antinomianism usually originates in mistaken notions of Christian liberty, or in confusion of views as to the relation between the moral law and the Jewish law of ceremonial ordinances.

ANTIN'OMY (Gk. *ἀντινομία*, *antinomia*, opposition of laws; from *ἀντί*, *anti*, against + *νόμος*, *nomos*, law). A word used by Kant to mark the "conflict between two propositions, each of which

seems to be true, but neither of which has any more claim to our assent than the other." Kant uses the term "antithetic" in the same sense. Such a conflict arises when our reason "ventures to go beyond the limits of our experience." There are four of these antinomies; the first two being called mathematical, the last two dynamic. In each case the positive assertion is called the thesis, its negation is called the antithesis. Briefly, his theses are: The world (1) is limited in space and time, (2) consists of parts that are simple, (3) admits of causality through freedom, (4) implies the existence of an absolutely necessary being. Over against these stand the antitheses: The world (1) is without limits in space or time, (2) consists of parts always composite, (3) admits of no causality but that of natural law, (4) implies the existence of no absolutely necessary being. Kant overcomes these antinomies by showing that the contradiction is not real if critically considered with due discrimination between noumena and phenomena. See CATEGORY; KANT.

ANTINORI, ăn'tê-nô'rê, MARQUESE ORAZIO (1811-82). An Italian zoölogist and African explorer, born at Perugia. He went to Egypt in 1859 and with Carlo Poggia explored the Upper Nile country. In the *Bulletin* of the Italian Geographical Society, of which he became one of the founders in 1867, he gives an interesting account of his travels through Nubia. He made a tour through Bogoland, north of Abyssinia, after the opening of the Suez Canal, and in 1875 went to Tunis to investigate the practicability of Roudaire's plan for flooding a portion of the Sahara Desert in order to establish communication with the Mediterranean. He headed an important expedition to Shoa in 1876 and gave the first definite information concerning the zoology of that country.

ANTINOÛS, ăn-tin'ô-ŭs (Gk. Ἀντίνοος, *Antinoos*). A beautiful youth of Claudiopolis, in Bithynia. He was page to the Emperor Hadrian, and the object of his extravagant affection, accompanying him in all his travels. He was either drowned accidentally in the river Nile, or, as some suppose, committed suicide from a loathing of the life he led, in 122 A.D. His memory and the grief of the Emperor were perpetuated by many beautiful statues and bas-reliefs, of which several have been found in the villa of Hadrian near Tivoli (Tibur). There is a colossal bust of him now in the Vatican, a statue in the Capitoline Museum, a bust in the Louvre, etc., and his head appears on many medals. In the attempt of sculptors to produce idealized representations of Antinoüs art received a great stimulus; these attempts resulted in "the triumph of original thought over eclecticism of form." Though the elements in these portrayals are all Greek, "the whole remains one of the most powerful presentments invented by the sculptor's genius." Consult Mrs. Arthur Strong, *Roman Sculpture*, 249 ff. (London, 1907). "In all the figures of Antinoüs," says Winckelmann, "the face has a rather melancholy expression; the eyes are large, with fine outlines; the profile is gently sloped downward; and the mouth and chin are especially beautiful." The city of Besa, in the Thebaïs, near which Antinoüs was drowned, was also rebuilt by Hadrian, and the name of Antinoöpolis conferred upon it, in memory of his favorite. Important festivals in his honor were held at Athens and at Eleusis. Antinoüs was further enrolled among the gods,

and temples were erected to him in Egypt and Greece. Antinoüs is a character in two historical romances, *Antinoüs*, by Taylor, translated from the German by Safford (New York, 1882), and *The Emperor (Der Kaiser)*, by Ebers (Stuttgart, 1880), done into English by Clara Bell.

AN'TIOCH (Gk. Ἀντιόχεια, *Antiocheia*; Lat. *Antiochēa*, or *Antiochia*). The ancient capital of the Hellenistic kings of Syria, on the Orontes, and the most magnificent of the 16 cities of that name built by Seleucus Nicator, and named for his father, Antiochus. Its site was admirably chosen. The river Orontes, issuing from the mountains of Lebanon, flows north as far as the thirty-sixth parallel of latitude and then southwest into the Mediterranean. On the left bank of the river, and at a distance of 20 miles from the sea, lay the famous city, in the midst of a fertile and beautiful plain, 10 miles long by 5 broad. By its harbor, Seleucia, it had communication with all the maritime cities of the West, while it became, on the other hand, an emporium for the merchandise of the East. Behind it lay the vast Syrian desert, across which traveled the caravans from Mesopotamia and Arabia. On the north, the plain of Antioch is bounded by the mountain chain of Ananus, connected with the southeastern extremity of Mount Taurus; and on the south, which is more rocky, by the broken declivities of Mount Casius, from which the ancient town was distant less than two miles. On this fair site, Greek colonies had been planted long before the time of Seleucus Nicator. In early times, a part of the city stood upon an island, which has now disappeared. The rest was built partly on the plain and partly on the rugged ascent toward Mount Casius. The slopes above the city were covered with vineyards, while the banks of the river displayed, as they do even at the present day, a gorgeous profusion of eastern fruit trees. The ancients called the city "Antioch the Great," "Antioch the Beautiful," and the "Crown of the East"; next to Rome and Alexandria it was the greatest city of the Roman Empire. It was a favorite residence of the Seleucid princes and of wealthy Romans and was famed throughout the world for its luxury. It received from Strabo the name of Tetrapolis, because four sites were successively built, each surrounded with a wall. Rebuilt by Seleucus Nicator about 300 B.C. to celebrate his victory at Ipsus, it received its first addition from him; its second from Seleucus Callinicus (246-226 B.C.); and its third from Antiochus Epiphanes (175-164 B.C.). From the first many Jews dwelt in the town, enjoying, by grant of Seleucus Nicator, equal rights with the Greeks. Its public edifices were magnificent. The principal were the palace, the senate house, the temple of Jupiter, burnished with gold, the theatre, amphitheatre, and Cæsarium. It had an aqueduct, a public promenade, and innumerable baths. Under the Romans it was the residence of the Governor of Syria, and the eastern headquarters of Cæsar, Agrippa, Augustus, Herod, Tiberius, and Antoninus Pius. After the founding of Constantinople it ceased to be the first city of the East, but it rose to new dignity as a Christian city, for Antioch was in fact the mother church of Gentile Christianity, the place where the Christians first received that name, the home of the first ministry of Paul, the spot from which he set out on his missionary journeys through Asia Minor and Greece, and

the scene of the first conflict between Jewish and Gentile Christianity, the result of which was the Apostolic Council in Jerusalem about 51 A.D. Ten Church councils were held at Antioch between 252 and 380. Churches sprang up, exhibiting a new style of architecture, which soon became prevalent; and even Constantine himself spent a considerable time here, adorning the town and strengthening its harbor, Seleucia.

The Antiochians themselves, however, brought about the ruin of their beautiful city. They were famous, above all other people in ancient times, for their biting and scurrilous wit and for their ingenuity in devising nicknames. When the Persians, under Chosroës, invaded Syria in 538 A.D., the inhabitants could not refrain from jesting at them. The Persians took ample revenge by the total destruction of the city, which, however, was rebuilt by Justinian. The next important event in its history was its conquest by the Saracens in the seventh century. In the ninth century it was recovered by the Greeks under Nicephorus Phocas, but in 1084 it again fell into the hands of the Mohammedans. The Crusaders besieged and took it in 1098, and it was held by the Christians until 1268. (See ANTIOCH, PRINCIPALITY OF.) Since then Antioch has undergone many vicissitudes. Its population at the height of its grandeur is estimated to have been 400,000. Probably no other great city in the world has suffered so frightfully from earthquakes as Antioch. It was destroyed by one in 526 A.D. A destructive visitation occurred in 1872.

The modern town of Antakiyeh, in the vilayet of Aleppo, is situated on the site of the ancient Antioch (Map: Turkey in Asia, G 4). It is poorly built, and presents a striking contrast to the magnificent walls of the old city, which are still partly preserved. It takes up only a small portion of the ancient city, the remainder being covered with olive trees and date palms. The inhabitants carry on some trade in olives, silk, and grain. The population is estimated at 30,000, of whom about half are Mohammedans, excluding some 8000 Ansariyeh; Orthodox Greeks number about 4000, and there are other Christians and Jews. Antakiyeh is an important American mission station. Consult: K. O. Müller, *Antiquitates Antiochenæ* (Göttingen, 1839); Ritter, *Erdkunde*, vol. xvii, pp. 1147-1210; *Cambridge Medieval History* (New York, 1911). The city figures largely also in Lew Wallace's novel, "Ben Hur" (New York, 1880).

ANTIOCH, PRINCIPALITY OF. A principality founded by the Norman crusader Bohemund (q.v.) in 1098. For about 30 years it was the most important and wealthy portion of the Christian possessions in Syria. Gradually it declined in political importance; but the city remained a stronghold of Christendom in the East until 1268, when it was captured by Bibars, Sultan of Egypt and Syria. Consult Rey, "Résumé chronologique de l'histoire des princes d'Antioche," in the *Revue de l'Orient Latin*, vol. iv (Paris, 1896).

ANTIOCH COLLEGE. An unsectarian co-educational college at Yellow Springs, Ohio. It opened in 1853, with Horace Mann as its first president. It claims to have been the first college in the world to admit both sexes of all races to equal privileges. Endowment, 1913, over \$100,000; value of buildings and grounds, \$150,000; library, 12,000 volumes; faculty, 20; attendance, 230. President, A. D. Fess, LL.D.

ANTIOCHIAN, ăn'tī-ō'kī-an, **SCHOOL.** The rival of the Alexandrian school. It held to the grammatical interpretation of Scripture, instead of to the allegorical or mystical. It dates from the martyr Lucian (died 311) and in its later form from Diodones of Tarsus (died 394). Its chief representatives are Chrysostom and Theodore of Mopsuestia. In theology, while in the main orthodox according to the Nicene type, it leaned toward asserting rather the conjunction than union of the two natures in Christ.

ANTIOCHUS, ăn-tī'ō-kūs (Gk. Ἀντίοχος, *Antiochos*). A common Greek name, borne by 13 kings of Syria, four kings of Commagene (a small country between the Euphrates and Mount Taurus), and many other persons of note. See the following articles.

ANTIOCHUS I SOTER (Gk. Ἀντίοχος Σωτήρ, *Antiochos Sōtēr*, savior, deliverer). King of Syria, 281-261 B.C. The son of Seleucus I Nicator and Apama of Sogdiana. He was born in 324 B.C., fought at Ipsus in 301 against Antigonus and Demetrius Poliorcetes; was associated with his father as ruler from 293, and became his successor after the murder of Seleucus by Ptolemy Ceraunus in 281. Stratonice, his father's wife, became his own consort, Seleucus giving her to him in view of their mutual affection. She was still living in 268. In addition to her he seems to have had for wife also a sister by the same name, daughter of Seleucus and Stratonice. In 275 he gained a decisive victory over the Gauls, who had invaded Asia Minor. But Appian is wrong in maintaining that he was given the surname Soter on this occasion. This seems to have been done only after his death. A cuneiform inscription of the year 269 enumerates all his titles, but does not give this one. On March 21, 268, he laid the foundations of the new Nabu temple at Borsippa. At the instigation of Magas of Cyrene, Antiochus declared war against Ptolemy II Philadelphus. He found an ally in Antigonus Gonatas, King of Macedonia and Greece, but the war led to no decisive issue. He maintained with difficulty the integrity of the great empire his father had left him. Antioch, with its suburb Daphnæ, Seleucia with Ctesiphon, and Sardis were the three capitals of the kingdom. In the last years of his reign he endeavored in vain to prevent Eumenes of Pergamos from maintaining his independence. Antiochus fell upon the battle-field, slain, it is said, by a Gaul, though this statement may be due to a confusion with the end of Antiochus Hierax (q.v.). Consult: Norris, *Annus et epochæ Syromacedonum* (1689); Vaillant, *Seleucidarum imperium* (1732); Frölich, *Annales regum et rerum Syriæ* (1754); Thirlwall, *History of Greece* (1835-44); Droysen, *Geschichte des Hellenismus* (1836, 1877; Eng. trans., 1883-85); Th. Reinach, *Trois royaumes d'Asie Mineure* (1888); Babelon, *Les rois de Syrie* (1890); Wilcken, in Pauly Wissowa, *Realencyklopädie* (1899); Bevan, *The House of Seleucus* (1902); Niese, *Geschichte der makedonischen Staaten* (1893-1903); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS II THE'OS (Gk. θεός, god). King of Syria, 261-246 B.C. Son of Antiochus I Soter and Stratonice; succeeded his father. His eight years' war with Ptolemy II Philadelphus cost him many provinces and cities in Phœnicia and Asia Minor. Only the expulsion of the tyrant Timarchus from Miletus in 250 B.C. can

be counted as a real success. He is said to have received the title "Theos" from the grateful Milesians; but this is doubtful. Theodotus seems to have established an independent kingdom in Bactria in 250 B.C., and the Parthian chief Arsaces, or his successor, Arsaces II Tiridates, took possession of Parthia and made himself practically independent in 247 B.C. Probably as early as 250 B.C. a reconciliation was effected between Antiochus and Ptolemy. The agreement was that the former should divorce his wife, Laodice, and marry the latter's daughter, Berenice. Upon the death of Ptolemy II in 247 B.C., Antiochus abandoned Berenice and her child, and went to Ephesus, where he took back Laodice and her sons. She, however, seems to have avenged herself by poisoning him in 246 B.C. Laodice then proclaimed her oldest son, Seleucus, king; and her servants by false promises lured Berenice and her son from Daphnæ, where they were strongly intrenched, and slew them both. Laodice's younger son was Antiochus Hierax. Consult: Niese, *Geschichte der makedonischen Staaten* (1893-1903); Reinach, *Trois royaumes d'Asie Mineure* (1888); Bevan, *The House of Seleucus* (1902); Bouché-Leclercq, *Histoire des Selcucides* (1913).

ANTIOCHUS III THE GREAT. King of Syria, 223-187 B.C. Son of Seleucus II Callinicus (246-226) and Laodice, a sister of Andromachus, ascended the throne at the age of 15, after the murder of his brother, Seleucus III Ceraunus (226-223). His first expedition was against Ptolemy IV Philopator (221-204), who had taken possession of Cœle-Syria and Phœnicia. But the revolts of Molon, Governor of Media, and his brother, Alexander, Governor of Persia, forced him to lead an army against them. He succeeded in defeating them, and also in subduing Artabazanes, King of Atropatene, 220 B.C. While he was occupied in these parts, however, Achæus, Governor of Asia Minor, assumed the royal diadem. Antiochus returned to Syria, suffered a severe defeat at the hands of Ptolemy IV at Raphia, 217 B.C., but still possessed sufficient strength to attack Achæus. After two years' siege Sardis was captured in 214 B.C., and this dangerous revolt was at an end. Soon after Antiochus marched against Xerxes of Armenia, besieged Arsamosata and received a tribute of 300 talents (212 B.C.). He then continued his march into Susiana and Media (210-209), and took 4000 talents of gold and silver from the temple of Anaitis in Ecbatana. Arsaces III Artabanus was defeated, and the Parthian capital Hecatompylus captured. Finally, Arsaces III sued for peace and promised tribute, 209 B.C. In 208 Antiochus made an attack upon Euthydemus of Bactria, and in 206 this King indicated his willingness to recognize the suzerainty of Syria. He furnished elephants and provisions for the expedition against Sophagasenus of Kophen (Kabul). From here Antiochus returned through Arachosia, Drangiana, Carmania, and Babylonia to Syria in 204 B.C. He now united with Philip of Macedonia against Ptolemy V Epiphanes. The battle of Paneas, in 198 B.C., in which Antiochus defeated the Egyptian general, Scopas, determined the fate of Palestine. But the Romans were not willing to allow further encroachments. In 196 B.C. they ordered him to return all places taken from Egypt and deprived him of the Thracian Chersonese that had been given to Seleucus by Lysimachus. Against the

counsels of Hannibal, who urged him to attack Italy itself, Antiochus went with his army to Greece, where he was defeated at Thermopylæ, 191 B.C. Still more crushing was his defeat at Magnesia in 190 B.C. In the treaty of 188 B.C. he was forced to abandon Asia Minor beyond the Taurus, to pay 15,000 talents, and to give hostages, among them his son. To raise the money he pillaged a temple of Bel in Elymais and was probably murdered by the outraged people in 187 B.C.

In addition to the works of Thirlwall, Reinaeh, Niese, Wilken, Bevan, and Bouché-Leclercq, quoted under Antiochus I, consult Flathe, *Geschichte Macedonias* (1834); Heyden, *Beiträge zur Geschichte Antiochos des grossen* (1873); Stark, *Gaza und die philistäische Küste* (1848); Gutschmid, *Geschichte Irans* (1888); Holm, *Griechische Geschichte*, iv (1891); Eng. trans., 1901).

ANTIOCHUS IV EPIPHANES (Gk. Ἐπιφανής, *Epiphanēs*, manifest or, more fully, Θεὸς Ἐπιφανής, *Theos Epiphanēs*, manifest god). King of Syria, 175-164 B.C. Son of Antiochus III, succeeded his brother, Seleucus IV Philopator (187-175). In 189 he had been sent to Rome as hostage, and he had been educated there; in 176 Seleucus had sent his own son Demetrius to take his place. Antiochus was on his way home, when the news reached him that his brother had been murdered by Heliodorus. He took possession of the throne that by right of succession belonged to Demetrius. Suspicious of the young son of Seleucus, he seems to have used Andronicus to remove him, after which Andronicus himself was executed. In 173 Cleopatra died, and hostilities with Egypt began. His first Egyptian campaign, however, did not occur before 169, as Niese and Wellhausen have recognized. He captured Pelusium, entered Egypt, and led Ptolemy VII Philometor as king into Memphis, sought in vain to storm Alexandria, but defeated Ptolemy IX Physcon in a naval battle before he was obliged by troubles in Syria to return. In Judæa Onias III had been removed from the high-priesthood, and his brother, Jason, who was a mere tool of the ambitious family of the Tobiadæ, put into his place in 173. Immediately before the Egyptian expedition the Tobiad Menelaüs secured from Antiochus the high-priestly office. When a rumor spread in Jerusalem that Antiochus had perished, Jason returned, but his brother, Onias III, was preferred by the people. Jason fell, and Onias was made high priest. Menelaüs and other Tobiadæ fled to Antioch. On his way back Antiochus went to Jerusalem to reinstate Menelaüs. Onias III fled to Egypt, where he was granted the privilege of building a temple at Leontopolis by Ptolemy VII Philometor. (See ONIAS'S TEMPLE.) Antiochus entered the temple in Jerusalem and took many of its treasures, among them the golden altar, the candelabra, and the table of incense. He does not seem to have shed any blood. In 168 he undertook his second campaign against Egypt, where Philometor and Physcon were now united against him. His progress was checked by the Roman legate, Popilius Lænas, who demanded immediate obedience to the demands of the Senate. Returning to Syria, he found many of the Jews imbittered by the indignities heaped upon them, rebellious against the illegitimate high priest, and scarcely concealing their joy over his humiliation. He therefore ordered the

walls to be razed, fortified the Acra, put in a strong garrison, destroyed in part the temple, erected on the top of the old altar a new one to Zeus Olympius (*Shikkuz Shamen*, 'abomination of desolation'; for *Baal Shamem*, 'lord of heaven,' Dan. xi. 31), abolished the sacred seasons, forbade circumcision, and burned sacred books, 168 B.C. This course of action may, in part, have been due to a genuine zeal for the god of Hellas, for whom he must have longed during his Roman days, and on whose sanctuaries at Athens, Olympia, and elsewhere he later lavished his gifts. On the other hand, reasons of state may have led him to build a temple to Jupiter Capitolinus in Antioch. That he should have forsaken the gods of his fathers to worship this strange "god of fortresses," seemed to the author of Daniel a particular sign of his wickedness (xi. 38). His stringent measures for the Hellenization of Judæa caused the Maccabæan revolt. Mattathias began the rebellion. After his death in 166, his son, Judas, defeated Apollonius, Seron, Gorgias, and finally Lysias himself; took possession of Jerusalem, except the Acra, and restored and rededicated the temple in December, 165 B.C. Meanwhile Antiochus had gone with an army, first against Armenia and Sophene, 166 B.C., then against Messene on the Persian Gulf, 165 B.C., and finally into Susiana, gaining many victories everywhere. He attempted to plunder the temple of Nanæa in Elymais, but the people defended successfully their sanctuary, and he was forced to retire to Babylon. In Persis he received the sad news from Judæa, and died in Tabæ, 164 B.C., from an illness.

Consult the histories of Greece by Thirlwall and Holm; the histories of the Seleucidæ by Vaillant, Frölich, Babelon, Bevan, Niese, and Bouché-Leclercq; the article on Antiochus IV, by Wilcken in Pauly-Wissowa, *Realencyklopädie*, and Sharpe, *History of Egypt* (1862); Gutschmid, *Geschichte Irans* (1888); Schürer, *Geschichte des jüdischen Volkes*, vol. i, p. 166 (4th ed., 1901); Wellhausen, *Israelitische und jüdische Geschichte* (6th ed., 1907); Droysen, *Kleine Schriften II*, p. 405 (1894) Hofmann, *De bellis ab Antiocho Epiphane adversus Ptolemacos gestis* (1899); Kaerst, *Geschichte des hellenistischen Zeitalters*, vol. ii (1909); Büchler, *Die Tobiaden und die Oniaden* (1899).

ANTIOCHUS V EUPATOR (Gk. Εὐπάτωρ, *Eupator*, born of a noble father). King of Syria, 164–162 B.C., son of Antiochus IV. He was only nine years old when his father died. Lysias became his guardian and regent of the Empire. Accompanied by the young King, Lysias marched against Judæa to quell the Maccabæan revolt. At Beth Zechariah Judas was defeated, Bethzur was taken, and the temple mountain was besieged. The Jews were obliged to negotiate for peace. They had to recognize the Seleucid authority, raze the fortifications of the temple, and accept the garrison in the Acra, but on the other hand were allowed religious freedom. During the absence of Lysias in Judæa a certain Philip, who had been with Antiochus IV Epiphanes when he died and was said to have received from him the diadem and seal that betokened supreme authority; took possession of Antioch. Lysias was quite able to cope with Philip, but the Romans sent an embassy demanding the destruction of the elephants in the army and the ships, and to this Lysias was obliged to agree

in order to maintain his power. He was overthrown, and Antiochus was killed by the soldiers, when Demetrius, son of Seleucus IV, who had escaped from Rome, seated himself upon the throne in 162 B.C. Consult especially Bevan, *The House of Seleucus* (1902); Wellhausen, *Israelitische und jüdische Geschichte* (1907); and Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS VI THE'OS EPIPHANES DIONYSUS. King of Syria, 145–142 B.C. Son of Alexander Balas and Cleopatra, was proclaimed King while still a minor, living at the court of Imalcue, or Yamliku, King of Chalcis, by Diodotus, called Tryphon, one of Alexander's generals. Tryphon was supported by Jonathan in his struggle against Demetrius, but became apprehensive of the growing power of the Jewish high priest. He took possession of his person and 1000 of his followers. These he massacred, and demanded a ransom for Jonathan, but finally put him to death in Baskama, 143 B.C. In 142 Antiochus, who was a mere child, died, as it was said, from an operation and Tryphon ascended the throne. The Romans inscribed the name of Antiochus as donor upon the golden statue of victory which Tryphon sent as a bribe. Consult Bevan, *The House of Seleucus* (1902); Wellhausen, *Israelitische und jüdische Geschichte* (1907); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS VII SIDE'TES (Gk. Σιδῆτης, *Sidētēs*, native of Side). King of Syria, 137–128 B.C. Son of Demetrius I, born at Side in Pamphylia. He resided in Rhodes when he learned that Demetrius II Nicator had been taken prisoner by the Parthians. He went to Antioch and was recognized as King. One of his first acts was to write to Simon, the Jewish high priest, confirming him in his position and granting him the right of coining money. Having overthrown Diodotus, however, he demanded of Simon Joppa, Gazara, and the citadel of Jerusalem. This Simon refused to give, and when Antiochus sent his general, Cendebæus, against him, Simon's sons, Judas and John Hyrcanus, gained a victory, 137 B.C. In 131 B.C. Antiochus marched against Jerusalem, having devastated Judæa, captured the city after a long siege, and imposed very severe conditions upon the country. John Hyrcanus was forced to pay a tribute of 500 talents, to give hostages, and to send troops for the Parthian war. Having restored order in Syria, Antiochus attacked Phraates 130 B.C., defeated him in three battles, and secured the freedom of his brother. But his demands were so exorbitant that the negotiations led to no treaty of peace, and a reversal of fortunes caused Antiochus to lose all that he had gained. Not to fall into the hands of his enemies, he hurled himself from a rock near Ecbatana in Media 128 B.C. Consult: Niese, *Geschichte der Makedonischen Staaten*, vol. iii (1903); Schürer, *Geschichte des jüdischen Volkes*, vol. i (4th ed., 1901); Wellhausen, *Israelitische und jüdische Geschichte* (6th ed., 1907); Bevan, *The House of Seleucus* (1902); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS VIII GRY'PUS (Gk. γρυπός, *grypos*, hook-nosed). King of Syria, 125–113 and 111–96 B.C. Son of Demetrius II Nicator and Cleopatra; succeeded his father in 125. He continued the struggle that Demetrius had had with Alexander, called Zabina, 'the purchased one,' and finally vanquished him in 121. Cleo-

patra, who found him too independent, wished to get rid of him, but he forced her to drink the poisoned cup she had prepared for him. For eight years he reigned peacefully, until in 113 Antiochus IX Cyzicenus aroused his suspicions. This son of Sidetes had just married Cleopatra, daughter of Ptolemy IX Physcon. With the aid of the Egyptian King he raised an army and captured Antioch. Antiochus Grypus recaptured the city, and his wife, Tryphæna, put her sister Cleopatra to death in a cruel manner. Soon after Cyzicenus defeated Grypus and avenged his wife on Tryphæna. A reconciliation was effected between the two brothers in 111, and they continued to reign over different parts of northern Syria. Antiochus VIII was slain by Heracleon in 96 B.C. Consult: Kuhn, *Beiträge zur Geschichte der Seleukiden vom Tode Antiochus*, vol. vii (1871); Wilcken, in *Hermes*, vol. xxix, and Pauly-Wissowa, *Realencyklopädie*; Schürer, *Geschichte des jüdischen Volkes*, vol. i, p. 175 (4th ed., 1901); Bevan, *The House of Seleucus* (1902); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS IX CYZ'ICE'NUS (Gk. Κυζικηνός, *Kyzikēnos*, native of Cyzicus). King of Syria, 113–95 B.C. Son of Antiochus VII Sidetes and Cleopatra; was sole ruler of Syria between 113 and 111, and from that time to his death held a part of Syria, adjoining Palestine. He aided the Samaritans against John Hyrcanus (110–107 B.C.) without success, and a second attempt to subdue Judæa with the aid of Ptolemy XI Lathyrus likewise failed. Having been defeated in a decisive battle with Seleucus VI, he took his own life in 95 B.C. Consult Kuhn, *Beiträge zur Geschichte der Seleukiden* (1871); Schürer, *Geschichte des jüdischen Volkes*, vol. i, pp. 175 f. (4th ed., 1901); and the histories of Niese (1893–1903), Bevan (1902), and Bouché-Leclercq (1913).

ANTIOCHUS X EU'SEBES (Gk. Εὐσεβής, *Eusebēs*, pious), King of Syria, 95–92 B.C. Son of Antiochus IX Cyzicenus. He continued the war against Seleucus VI and forced him to retire to Mopsuestia, where he was murdered by the populace in 95 B.C. He also defeated Antiochus XI and Philip in 93 B.C., but was himself vanquished by Philip and Demetrius III in 92 B.C. and obliged to flee to the Parthians. He is supposed to have died in 75 B.C., leaving two sons, Antiochus XIII and Seleucus Cybiosactes. His widow, Selene, was given a few towns in Syria by Tigranes of Armenia, who in 92 B.C. took possession of Antioch. Consult histories of Niese (1893–1903), Bevan (1902), and Bouché-Leclercq (1913); Kuhn, *Beiträge zur Geschichte der Seleukiden* (1871), and Schürer's *Geschichte des jüdischen Volkes*, vol. i (4th ed., 1901).

ANTIOCHUS XI EPIPH'ANES PHILADELPHUS. King of Syria, 95–93 B.C., son of Antiochus VIII Grypus; upon the death of Seleucus VI in 95 B.C., he assumed the royal diadem; together with his brother Philip he took vengeance upon the people of Mopsuestia, who had murdered Seleucus VI. But on his return to Syria he was defeated by Antiochus X, and was drowned in the Orontes in 93 B.C. Consult Schürer, *Geschichte des jüdischen Volkes*, vol. i, p. 176 (1901); Bevan, *The House of Seleucus* (1902); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS XII DIONYS'SUS (Gk. Διονύσιος, *Dionysos*, Bacchus). King of Syria, 85 B.C., son of Antiochus VIII. He took the crown

when he learned that his brother Demetrius III had been made a prisoner by the Parthians and intrenched himself in Demetrius's capital, Damascus. He was at first victorious in his campaign against the Nabataeans, but was defeated in a second battle, and lost his life in 85 B.C. Consult Bevan, *House of Seleucus* (1902); Schürer, *Geschichte des jüdischen Volkes* (1901); Th. Reinach, *Mithridate Eupator* (1890); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS XIII ASIATICUS (Gk. Ἀσιατικός, *Asiatikos*, Asiatic). King of Syria, 69–64 B.C., son of Antiochus X. He was sent by his mother, Selene, to Rome, together with his brother Seleucus Cybiosactes, in 74 B.C., to present his claims to the throne of Egypt, but returned to Syria in 71, having been kept for a ransom by Verres in Sicily, as Cicero informs us. After his victory over Tigranes, in 69 B.C., Lucullus gave to Antiochus a large part of Syria, which he retained until Pompey made it a Roman province, in 64 B.C. Consult: Schürer, *Geschichte des jüdischen Volkes*, p. 178 (1901); Niese, *Geschichte der Makedonischen Staaten* (1903); Bevan, *The House of Seleucus* (1902); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS HI'ERAX (Gk. Ἱέραξ, *hierax*, hawk). Son of Antiochus II and Laodice. He was made King of Cilicia by Ptolemy III Euergetes in 243 B.C. Ostensibly for the purpose of assisting Seleucus II Callinicus (246–226) to recover certain provinces that the Egyptian King had taken from him, but really to deprive him of all that he had left, Antiochus sent an army to Syria. Ptolemy came to an agreement with Seleucus, but the war between the two brothers continued. With the aid of the Gauls, Antiochus won a decided victory near Ancyra in 242. Seleucus was supposed to have been slain, and Antiochus mourned him. He then turned his arms against Demetrius of Macedonia and subsequently against Attalus of Pergamus. The war with Seleucus was renewed, and Eumenes used the opportunity to take possession of a large part of Asia Minor. After a signal defeat at the hands of Seleucus, Antiochus fled first to Cappadocia and then to Armenia. Suspecting foul play, he left for Egypt. Ptolemy III made him a prisoner. He escaped, however, and ended his stormy career at the hands of brigands in Thrace, 225 B.C. Consult Wilcken, in Pauly-Wissowa, *Realencyklopädie*; Holm, *Griechische Geschichte*, vol. iv (1891; Eng. trans., 1885); Bevan, *The House of Seleucus* (1902); Bouché-Leclercq, *Histoire des Seleucides* (1913).

ANTIOCHUS OF AS'KALON (?–c.68 B.C.). A Greek philosopher. He was a pupil of Philo and succeeded him as head of the celebrated Academy (see **ACADEMUS**) near Athens. He spent some time in Rome, and was on friendly terms with L. Lucullus. Cicero heard him in Athens in 79–78 B.C. Abandoning the more recent traditions of the Skeptic system in favor of a dogmatic eclecticism, seeking to combine Academic, Peripatetic, and Stoic doctrines into a new system, he introduced into the Academy the philosophy of Stoicism, the fundamental tenets of which he believed to have originated in the Old Academy of Plato. Consult R. Hoyer, *De Antiocho Ascalonita* (Bonn, 1883); Zeller, *Philosophie der Griechen*, 3d ed., vol. iv, pp. 598–610; and various notes, as well as the Introduction, in J. S. Reid's edition of the "Academica" of Cicero (London, 1885).

ANTIOPE, ān-tī'ō-pē. See **AMPHION**.

ANTIOQUIA, ä'n'tê-ô'kê-ä. A department of Colombia, South America, bounded by the departments of Bolivar on the north, Santander on the east, Tolima on the south, and Cauca on the west. Its area is 26,612 square miles. Situated in the region of the Cordilleras, Antioquia has valuable forests, but the soil is not suited to agricultural pursuits. The chief occupation is mining, for the mineral wealth of the department is considerable, especially in the north. Coal, iron, gold, and platinum are found. The region was first explored by Robledo about the middle of the sixteenth century. The population in 1912 was 740,937. Capital, Medellin.

AN'TIPÆ'DOBAP'TISTS. Those who oppose infant baptism. See BAPTISM, INFANT.

AN'TIPAR'ALLELS (*anti* + *parallel*). If a pencil of two lines, $O-XY$, is cut by two

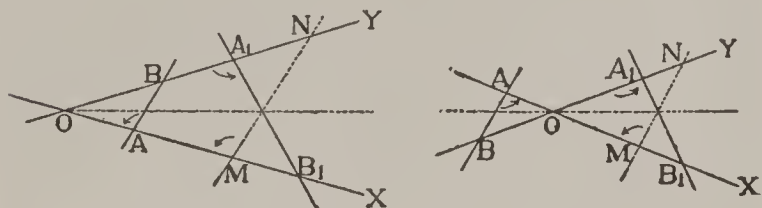


FIG. 1.

parallel lines, AB , MN , and if MN revolves through a straight angle about the bisector of $\angle XOY$ as an axis, falling in the position A_1B_1 , then AB and A_1B_1 are said to be antiparallel to each other. OA and OA_1 are called corresponding segments of the pencil, as are also OB and OB_1 . A and A_1 are called corresponding points, as are also B and B_1 . The triangles OAB and OA_1B_1 are similar to each other. The concept of antiparallels materially simplifies the treatment of a number of propositions of elementary geometry; e.g., in the above figure it is easily seen that $OA:OM=OB:ON$, whence $OA \cdot OB_1=OB \cdot OA_1$. In the following figures, since AB and A_1B_1

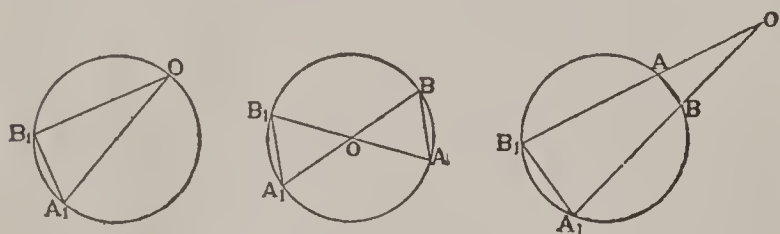


FIG. 2.

are antiparallels, we have at once the proof of the important proposition that wherever the point O be taken $OA \cdot OB_1=OB \cdot OA_1$.

ANTIP'AROS (Gk. 'Αντίπαρος, Opposite Paros). Anciently called Olearos or Oliaros. One of the Cyclades Islands, celebrated for a stalactitic cave, near the south coast (Map: Greece, G 4, 5). It is separated from Paros by a narrow strait. It contains about 600 inhabitants, and forms a part of the eparchy of Naxos. Antiparos is 7 miles long by about 3 wide; it is scantily supplied with water, but the flats in the north and the west are tolerably fertile. Grain and wine are cultivated, and there is pasturage for large flocks of goats. The principal occupation of the inhabitants is fishing. From Kastron, the only village on the island, the distance to the stalactitic cave is about an hour and a half's ride. This wonderful cave is not mentioned by any Greek or Roman writer whose works are extant, but must have been visited by the curiosity-hunters of antiquity, for the names of ancient tourists are inscribed about the entrance. It may well have been a place of worship. The entrance is

near the top of a mountain on the southern coast. From a small chamber a long and somewhat dangerous descent leads to the great cavern, 80 feet high, more than 300 feet long, and 100 feet broad, which contains remarkable specimens of stalactitic formation. The cave was first made known to the modern world by M. de Nointel, French ambassador to the Porte, who, in 1673, spent three days in it and caused the Christmas mass to be celebrated on a natural altar. Views of the entrance and the exterior are published in the *Bulletin de géographie historique et descriptive* (Paris, 1887-97). Excavations by Messrs. Bent and Tsountas have brought to light a number of graves belonging to an early period in the "Island" civilization. Since 1872 profitable lead mines have been worked on the island. Consult Bent, *The Cyclades* (London, 1885).

AN'TIPAS. See HEROD.

ANTIP'ATER (Gk. 'Αντίπατρος, *Antipatros*). (c.400-319 B.C.). 1. The son of Iollas, and one of the most distinguished generals of Philip of Macedon and Alexander the Great. It was especially through the loyal services of Antipater and Parmenion (q.v.) that Alexander was enabled to establish his kingdom on a firm basis. When Alexander led his troops into Asia, he left Antipater in sole charge of affairs in Macedonia. The latter discharged the duties of his office with great ability, suppressing insurrections in Thrace and Sparta and supporting Alexander with fresh troops from home. But he was on the point of being superseded, at Alexander's orders, by Craterus, through the influence of Olympias, the mother of Alexander, when Alexander died. In the partition of Alexander's domain among his generals, the government of Macedonia was assigned to Antipater anew, and he was soon after called upon to defend himself against an alliance of the Grecian States, which, on Alexander's death, sought to regain their freedom. He at first met with reverses, but, with the assistance of Craterus, who was also his son-in-law, and Leonnatus, he finally brought the allies into subjection in 322 B.C. This war is usually called the Lamian War, from Lamia, where Antipater was besieged in 323 B.C. Everywhere oligarchies were established, and Athens was obliged to deliver up Demosthenes and Hyperides and to receive a garrison in Munychia. This war was followed by another with Perdiccas (q.v.), Antipater's son-in-law, and Antipater was again successful. After the murder of Perdiccas, in 321 B.C., Antipater was appointed to the supreme regency of Macedonia and the guardianship of Alexander's children. He made a new division of the kingdom, but died shortly after, in 318 B.C., leaving the regency to Polysperchon and a subordinate position only to his own son, Cassander. (See ANTIGONUS.) 2. Son of Cassander and King of Macedonia. His reign followed that of his brother Philip, who had followed Cassander in 297 B.C. He was killed, 287 B.C., by order of Demetrius Poliorcetes. 3. An Idumean, Father of Herod the Great. His first appearance is in the reign of Aristobulus II (69-63 B.C.), as a man of great wealth and important connections. He supported Hyrcanus II against Aristobulus, and after Hyrcanus, in 63 B.C., opened the gates of Jerusalem to Pompey, the influence of Antipater grew apace. In the struggle between Pompey and Cæsar he supported the former, but after the defeat of Pompey made his peace with Cæsar

and continued thereafter his firm adherent. Cæsar showed him many marks of favor. Antipater was poisoned in 43 B.C. 4. Son of Herod the Great by his first wife, Doris; a worthless prince, who was perpetually conspiring against the lives of his brothers. He was finally tried before Quintilius Varus, and executed in prison five days before Herod died.

ANTIP'ATHY (Gk. *ἀντί*, *anti*, against + *πάθος*, *pathos*, suffering, affection, emotion, feeling). By derivation, the opposite of *sympathy* (q.v.). It may be defined as a permanent aversion to, or settled incompatibility with, some object or some quality of an object. We may distinguish between formal or logical antipathy and concrete or actual antipathies. The choleric temperament is, formally, antipathetic to the phlegmatic, and the sanguine to the melancholy. (See TEMPERAMENT.) The term is, however, more usually restricted to such definite cases of individual aversion as the dislike shown by many persons to certain animals—snakes, mice, toads, cats. Some of these antipathies, doubtless, have their root in a cultivated affectation, or in the unconsidered encouragement of a prejudice imbibed in childhood; others date from a particular occasion of fright, or are due to the chance association of the object with an unpleasant incident. If, e.g., a house swarms with mice during a period of great mourning, it is probable that the mourners will henceforth show a marked antipathy to these animals. But there are cases which require a different principle of explanation. The aversion to snakes, e.g., which often prevails among those who have never come into contact with the reptiles and who have nothing to fear from those that they may happen to meet, is, perhaps, a phylogenetic symptom. The snake is the chief enemy of the monkeys, as readers of Kipling's *Jungle Book* will remember; and the liability to fear of snakes may be a heritage from our pre-human ancestry. Some persons, again, cannot enter a room which contains a cat. The explanation may be that the valerianic odor peculiar to the animal is automatically associated in certain constitutions with organic sensations of nausea or shuddering, just as there are persons who are subject to shivering and gooseflesh when a slate pencil squeaks upon a slate. At any rate, the mammals that excite antipathy (mouse, cat, fox, hare, pig) have one and all a marked and peculiar scent; and we know from animal psychology that a smell stimulus may set up a well-marked chemoreflex. The aversion to mice may be derived in part from the uncanny and snake-like character of their locomotion and in part from the ubiquity which their small size makes possible. The aversion to toads (apart from superstitious belief in their poisonous properties) may be due to the clammy cold of their skin; we all know the horrible feeling that arises if, being in the pantry in the dark, the hand by chance is laid upon a piece of cold potato. Many historical cases of antipathy cannot now be explained, simply because there is only the record of the bare fact, with no mention of the conditions under which the antipathy took shape.

Bibliography. A. Mosso, *Fear* (New York, 1896); W. James, *Principles of Psychology* (New York, 1890). On reflex sensations, consult W. Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1910-11). See COMMON SENSATION.

ANTIP'ATRIS. A city of Palestine, built by Herod the Great (37-34 B.C.) in honor of

his father, Antipater. It was situated on the river 'Aujeh, in the southeastern part of the Plain of Sharon, about 11 miles east-northeast of Joppa—probably the modern Ras el-'Ain. In Roman times it was of importance as the junction of several military roads leading from the south and east to Cæsarea, the Roman capital of Palestine. By the Jews it was considered the northwest limit of strictly Jewish territory, its location being within a few miles of the southern border of Samaria. Josephus often mentions it. Paul was escorted as far as Antipatris by Roman soldiers when he was taken from Jerusalem to Cæsarea (Acts xxiii. 31-32).

AN'TIPE'RIOD'ICS. Drugs given to arrest or alleviate the paroxysms of certain periodic fevers. The typical periodic fever is malaria, and the typical antiperiodic is its specific remedy, quinine. Other antiperiodic drugs in general use are cinchona, salicylic acid, eucalyptol, Warburg's tincture, and arsenic.

ANTIPHANES, ān-tīf'ā-nēz (Gk. 'Αντιφάνης). A Greek comic poet of the fourth century B.C. He was one of the chief representatives of the Middle Comedy. Many fragments of his works—which numbered, according to some estimates, 365, and to others 260—are preserved. He is praised by Athenæus for his polished diction. Consult Meineke, *Poetarum Comicorum Græcorum Fragmenta*, vol. iii (Berlin, 1839-57).

ANTIPH'ILUS (Gk. 'Αντίφιλος, *Antiphilos*). A Greek painter of Egyptian birth, who lived at the court of the first Ptolemy, about 330 B.C. Quintilian (xii, 16, 6), who rates him high among the painters of the age of Philip and Alexander, says he excelled in the graceful treatment of subjects of high art as well as of daily life.

AN'TIPHLOGIS'TIC. An agent supposed to combat or prevent inflammation, such as blood-letting, or the internal administration of aconite, veratrum, gelsemium, etc. A favorite local application consists of fuller's-earth and glycerine.

AN'TIPHON (Gk. *ἀντίφωνα*). A notable part of the breviary offices in all Western uses. The recitation of the Psalter forming the staple of the office, antiphons or short texts (generally from Holy Scripture), having special reference to the feast or season celebrated, were sung in connection with the psalms and evangelical canticles to give color and appropriateness to the invariable parts of the service. On the greater festivals (hence called "double feasts"), the antiphons are sung entire before and after the psalms; at other times only the first two or three words were sung before and the entire antiphon after. Pope Gregory I in 590 prepared the first regular *antiphonarium*, a service book containing the proper music for the antiphons.

ANTIPHON (Gk. 'Αντιφών) (480-411 B.C.). The earliest of the Ten Attic Orators in the Alexandrian Canon of Orators, and a teacher of oratory. He was the son of Sophilus the Sophist and was born at Rhamnus in Attica. Although Antiphon was undoubtedly influenced by the teachings of Gorgias, he never developed so rhetorical a style as some of the later orators. He labored to make his arguments clear, solid, and convincing, so that it might be impossible for the judges who listened to the speeches he wrote to refuse their assent to his propositions. His success was unmistakable. He first made oratory a matter of rules and principles and so was "the first contributor to the rules of eloquence." Although he never made a public appearance as a pleader in the courts of justice,

but contented himself with writing speeches for others to deliver, he acquired great influence, which he did not fail to exert for the furtherance of his political principles. He several times held commands in the Peloponnesian War. To him must be attributed the overthrow of the Athenian democracy (411 B.C.) and the establishment of the oligarchical government of the Four Hundred; for although Pisander (q.v.) figured prominently before the people in this revolution, the whole affair, according to Thucydides, was secretly planned by Antiphon. The oligarchical government fell within the year, and Antiphon was brought to trial for treason for having attempted to negotiate peace with Sparta. Thucydides affirms that an abler defense was never made by man in a similar position. Nevertheless he was convicted and put to death, his property confiscated, and his house razed to the ground; it was ordered that his remains should not be interred in Attica, and his children were forever declared incapable of enjoying civic privileges. Of the 60 orations which the ancients possessed, only 15 have come down to us. All deal with murder cases. Three were under Antiphon's name, written for others, and are admired for their clearness, purity, and vigor of expression; the remaining 12 appear to have been intended as specimens of school rhetoric for his pupils. The style is severe and archaic, lacking in ease. They have been edited by Blass (Leipzig, 1881). Consult also Blass, *Attische Beredsamkeit* (Leipzig, 1887-98), and Jebb, *Attic Orators* (London, 1876-80).

ANTIPHON (Gk. Ἀντιφῶν, *Antiphōn*) and **BRY'SON** (Gk. Βρύσων, *Brysōn*). Greek mathematicians of the fifth century B.C., who are credited with having introduced the process of exhaustion for the purposes of the quadrature problem. See QUADRATURE.

ANTIPH'ONY (Gk. ἀντί, *anti*, against + φωνή, *phōnē*, sound, voice). A name given by the ancient Greeks to a species of musical accompaniment in the octave, by instruments or voices, in opposition to that executed in unison, which they called *homophony*. Antiphony is also the name of a species of sacred song sung by two parties, each responding to the other, a practice which was cultivated in the early ages by the Hebrews, Greeks, and Romans. Many of the psalms of David show that antiphonal singing was then in use. Its introduction into the Greek church is ascribed either to Ignatius, Bishop of Antioch, in the second century, or to St. Chrysostom, about 400 A.D.; and Ambrosius, Bishop of Milan, is said to have introduced it into the Western church in the fourth century. The dividing of the antiphonies into verses, with rules regarding the same, is attributed to Pope Celestine in 432. The reformed Christian churches of Germany and England have still retained a certain degree of antiphonal singing, and there are several antiphonal choirs in America, notably that in the church of the Paulist Fathers in New York. The chanting of the psalms in the English cathedral service is an imitation of the ancient antiphony.

ANTIPH'RASIS (Gk. ἀντίφρασις, from ἀντί, *anti*, against, contrary + φράζειν, *phrazein*, to point out, declare, tell). A technical term used by the ancient rhetoricians and grammarians, signifying, etymologically, "contrary-speaking." Properly, it denoted the process of expressing an idea, generally an unpleasant idea, by using a word or expression of meaning opposite to

the natural one. Thus, the Furies were called the *Eumenides* ('the kindly-minded ones'), and the Black Sea, though inhospitable ἄξεινος, *axei-nos*), was named *Pontos Euxinos* ('the Hospitable Sea'). In Greek and Roman comedy, too, the names of the personages often had a meaning diametrically opposed to the characters possessed by them. This use of antiphrasis is common in some modern writers, e.g., Thackeray and Sheridan. An example is Mrs. Candour in the *School for Scandal*. The word "antiphrasis" was used also in a broader sense of the process of expressing one idea by negating the opposite; e.g., *not unmindful*, meaning emphatically *mindful*. This figure is, however, called distinctively Litotes.

ANTIPODES, ăn-tĭp'ō-dēz (Gk. pl. ἀντίποδες, from ἀντί, *anti*, against + πόυς, *pous*, foot). Literally, those who have their feet over against each other. As used in geography, the term means the dwellers at the opposite extremities of any diameter of the earth. From this primary relation there necessarily arise many secondary relations. Antipodes must be on one and the same meridional circle, separated from each other by half the circumference. They must therefore differ in longitude by exactly 180°, with the exception of the poles themselves, which have an indeterminate longitude; and being separated from each other by half the circumference, they must be equidistant from the equator in opposite directions. Take London as an example, in lat. 51° 30' N. and long. 0° 5' W. Its antipodes must be in lat. 51° 30' S. and in long. 179° 55' E., coinciding pretty nearly with a small island to the southeast of New Zealand. This small island, in honor rather of London than of itself, has appropriated the peculiar name of Antipodes Island.

With reference to the earth's daily rotation, noon of the one side must be midnight of the other; while with regard to its annual revolution, summer and autumn of the one side must be winter and spring of the other. With respect, however, to the former contrast, some explanation may be required. If this, for instance, is Wednesday in London, was last midnight in that city the noon of Tuesday or of Wednesday at Antipodes Island? The answer to this question depends upon a conventional usage, according to which (with a few exceptions, dictated by practical considerations) the time of all places east of Greenwich is said to be later than that at Greenwich, and the time of all places west of Greenwich is said to be earlier than that at Greenwich. To avoid confusion it has been agreed, further, to think of Antipodes Island as situated *east* of Greenwich. With this in view, it is clear that the midnight in question at London corresponded to Wednesday noon at Antipodes Island. See INTERNATIONAL DATE-LINE.

ANTIPODES IS'LAND. A small island southeast of New Zealand in 49° 42' S. lat. and 178° 43' E. long., so called because it is nearly the antipode of London (Map: World, Western Hemisphere, O 3). It is uninhabited and has an area of only about 20 square miles. See ANTIPODES.

AN'TIPOPE. A pontiff elected in opposition to one canonically chosen. The regular popes of Rome were occasionally out of favor with a faction which chose its own bishop (e.g., Hippolytus, 218-223; Felix II, 355-356), but the first Antipope is reputed to be Laurentius, elected

in 498, in opposition to Symmachus. Several emperors of Germany set up popes against those whom the Romans had elected without consulting them. Otho the Great displaced successively two popes of Rome; and when the Antipope Sylvester III had expelled Pope Benedict IX, Conrad II, Emperor of Germany, brought back this ecclesiastic, who transferred his dignity to Gregory VI (1044). There were now, consequently, three popes, and their number was increased to four by the election of Clement II in 1046. Shortly after, Alexander II found a rival in Honorius II (1061), and in 1080 the same unseemly spectacle was witnessed when Henry IV, Emperor of Germany, elevated to the papal chair Guibert of Ravenna, under the title of Clement III, in opposition to his implacable adversary, Gregory VII. But after the death of Gregory, Clement was himself opposed successively by Victor III and Urban II, and at last died at a distance from Rome, having just beheld the exaltation of Pascal II as the successor of Urban. During the twelfth century several antipopes flourished, such as Gregory VIII and Honorius III. On the death of the latter, France began to intermeddle in these disgraceful strifes and upheld the cause of Innocent II against Anacletus, while the kings of Sicily, on the other hand, more than once set up a pontiff of their own against the choice of the emperors. Between 1159 and 1378 there were four antipopes; but the most remarkable epoch is "the great schism of the West" produced by these unedifying rivalries in 1378—a schism which divided the Church for 50 years. It broke out after the death of Gregory XI at the election of Urban VI, whom the voice of the Roman people, demanding an Italian Pope and not one who should fix his pontificate, like several of his predecessors, at a distance from Rome, had elevated to the papal throne. The French cardinals objected, withdrew to Provence and elected a new Pope, under the name of Clement VII, who was recognized by France, Spain, Savoy, and Scotland, while Italy, Germany, England, and the whole north of Europe supported Urban VI. The schism continued after their death, when three popes were elected by different parties, all of whom were deposed by the Council of Constance, in 1415, and Cardinal Colonna elected in their place, under the title of Martin V. The last Antipope was Felix V (1439–49). These divisions are often alleged as an argument against the doctrine of papal infallibility; but Catholics consistently affirm that the privilege of infallibility is only claimed in matters of doctrine, and has no relation to questions of fact, such as disputed succession or canonicity of election.

AN'TIPYRETIC (Gk. *ἀντί*, *anti*, against + *πυρετός*, *pyretos*, burning heat, fever). Any drug which lowers febrile temperature by action upon the blood, the circulation, or the secretion of sweat, or by changes in heat production and dissipation through the nervous system. The most important are antipyrine, acetanilid, phenacetine, quinine, salicylic acid (qq.v.) and its derivatives, and others of the benzene series. Less importance than formerly is attached to the action of such drugs in diminishing temperature, as fever is now regarded as a symptom of some disturbance, a symptom which is in many cases best relieved by removing its cause. If the temperature is so high as to appear to be injurious in itself, or if it causes discomfort, these

remedies may be of value. Many of them are efficacious also in relieving pain; e.g., salicylic acid in acute rheumatism; antipyrine, antifebrine, or phenacetine in any painful febrile condition. Quinine is used in malarial fever, not only for its antipyretic effect, but to overcome the malarial organism. (See **MALARIA**.) Cold baths, sponges, packs, etc., are frequently employed to reduce temperature. The antipyretic action of drugs is usually accompanied by more or less depression of the heart. See **CINCHONA**; **SALICYLIC ACID**.

AN'TIPY'RINE (derivation same as of *antipyretics*). A synthetic drug, derived from phenyl hydrazin, having the chemical formula $C_{11}H_{22}N_2O$. It occurs in scaly crystals, colorless and odorless, has a bitter taste, and is freely soluble in water and alcohol. Antipyrine is chiefly used as an antipyretic, but it is also an efficient pain reliever, and nerve sedative, and possesses diaphoretic, mydriatic, and hypnotic properties. Locally it is antiseptic, hemostatic, and astringent. As an antipyretic it acts promptly, lowering the temperature and inducing perspiration. As an analgesic it is used in headache, neuralgia, and dysmenorrhœa; and in acute rheumatism, where it acts somewhat like salicylic acid. As a nerve sedative it is valuable in epilepsy and whooping cough, and to a less extent in chorea.

Like most coal-tar derivatives, antipyrine frequently produces untoward symptoms. Cyanosis, frequent and feeble heart action, dyspnoea, sometimes collapse, occur not uncommonly. Serious symptoms have been produced by 10 or 15 grains, and even death has been caused. This must be remembered especially in cases where the natural tendency of the disease is toward heart weakness. In these cases it should be given sparingly in conjunction with a stimulant. Individual susceptibility varies greatly. The drug sometimes produces rashes which resemble measles, scarlatina, urticaria, erythema, and purpura. These are unpleasant, but not serious. See **ACETANILID**; **PHENACETIN**.

AN'TIQUA'RIAN SOCI'ETIES. Organizations in Europe, England, and America for the promotion of the study of antiquities. The London Society of Antiquaries was antedated by a society established in 1572 and dissolved by James I about 1604. The present London society began to meet about 1707 and received its charter in 1751. The Scottish Society of Antiquaries was founded in 1780, the French society in 1814, and the American Antiquarian Society (see **ANTIQUARIAN SOCIETY, AMERICAN**) in 1812.

ANTIQUARIAN SOCIETY, AMERICAN. A society founded in 1812, which has its headquarters at Worcester, Mass. It owns a library of more than 100,000 volumes, which is especially rich in manuscripts, newspapers, political pamphlets, and early American publications. The *Transactions* have been published since 1820, and the *Proceedings* semi-annually since 1849. A new library for the society was completed and occupied in 1910. The society maintains a fund aggregating over \$100,000 for the support of various departments of its work. See **ANTIQUARIAN SOCIETIES**.

AN'TIQUARY, THE. One of Scott's Waverley Novels (1816), and its chief character, Jonathan Oldbuck, laird of Monkbarons.

ANTIQUÉ, *än-tĕk'* (Lat. *antiquus*, old). As the term "ancients" is commonly applied to the Greeks and Romans, the word "antique" is used

with reference to their works of art, especially their incomparable sculptures. The antique style in works of art is distinguished by critics from the romantic or mediæval, and also from the modern. But anything made to resemble the relics of classic art, however frankly or remotely, may be classed as antique. Moreover, the term has several special meanings. Thus, according to a ruling of the United States Treasury Department, anything made before 1700 A.D. is antique and hence exempt from tariff duty. In printing there is a certain form of type that is known as antique; while in bookbinding the term is applied to embossed, but not gilded, designs or lettering.

ANTIQUITIES. See ARCHÆOLOGY.

ANTIQUITY OF MAN. See MAN.

ANTI-RENTISM. A movement partly political, extending over the years 1839-47, among the leaseholders in Albany, Columbia, Delaware, Montgomery, Rensselaer, and other counties in New York State. These leaseholders held their land under a sort of feudal tenure, in spite of the virtual abolition in 1775 of many of the old manorial and patroonship rights (see PATROONS), the various farms being leased, for the most part, either in perpetuity or for a period of two or three lives, while the ground rents were generally paid in kind and certain feudal services were not infrequently exacted. As the population increased, such an arrangement grew exceedingly irksome to the tenants, who were nominal but not real owners, and who could not, as a rule, transfer their titles without paying to the landlords a portion (usually a quarter) of the amount received. The crisis came in 1839, when Stephen Van Rensselaer (q.v.), one of the largest landholders, died. He had been remiss in collecting his rents, and his heirs served writs of ejectment on tenants in Albany County. The tenants thereupon resisted, and on several occasions the resulting disturbances were so serious that the militia had to be called out. By 1842 the trouble had spread to other manors. Anti-rent associations were formed over most of the leasehold districts, rents were withheld, and evictions resisted, while the grievances of the tenants were aired in newspapers devoted to their interests and in memorials to the Legislature.

The question became political and was fomented by agitators for their own special purposes, the anti-rent party ultimately controlling the legislative delegations of 11 counties. Lawlessness became prevalent, and bands of men, absurdly disguised as "Indians," assaulted, tarred, and feathered, and, in several instances, murdered, deputy sheriffs and their assistants. A law passed by the Legislature against men appearing in public in disguise proved ineffectual, and on Aug. 7, 1845, O. N. Steele, a deputy sheriff of Delaware County, was surrounded and shot down by disguised men while serving a process. Governor Wright forthwith put the county under martial law, and arrested over 100 men, of whom 50 were convicted, 20 being sent to the State prison and 2 sentenced to death. The death penalty was commuted for life imprisonment, and eventually all of the prisoners were pardoned by Governor Young. The repressive measures broke up the unlawful resistance, though they caused the defeat of Governor Wright by John Young, the anti-rent candidate, at the next election. In 1846 an article was inserted in the State constitution abolishing all feudal tenures and forbidding future leases of

agricultural land for more than 12 years. In order to settle the question of title the Attorney-General brought suit against Harmon Livingston. This suit resulted in Livingston's favor, but several out of the multitude of individual suits against the landlords went to the Court of Appeals, which decided in 1852 that without reference to the Constitution of 1846, agreements in restraint of alienation of titles in fee were void. Consult: Cheyney, *The Anti-Rent Agitation* (Philadelphia, 1887), and Murray, *The Anti-Rent Episode in New York*, in the "Report of the American Historical Association for 1896"; also Alexander, *Political History of the State of New York*, vol. ii (New York, 1906); Wright, *Life of Governor Silas Wright* (Auburn, 1847).

AN'TIRRHINUM. See SNAPDRAGON.

AN'TISAB'BATA'RIANS (*anti* + Gk. *σάββαρον*, *Sabbaton*, Sabbath). Those who recognize no obligation to observe either the Jewish Sabbath or the Christian Lord's Day, deeming any one day as sacred as another.

ANTI-SALOON LEAGUE. An organization which was first founded in Ohio as a State body in 1893. The idea spread rapidly, and the league became national two years later. Its object is the radical repression and ultimate suppression of the liquor traffic. Its method includes the federation of existing agencies, especially the churches. There are departments of agitation, legislation, and law enforcement. The league is interdenominational and omnipartisan. It has branches in every State in the Union and publishes papers in nearly all the States. Practically every religious denomination in the United States has a vice president on the governing board of the league. The league has been most effective in the work which it has undertaken. Through its efforts large areas have been freed entirely from the sale of liquor and in other areas it has been greatly restricted. The work of passing restrictive measures through the State legislatures has been aggressively carried on, and where such measures have been passed agents of the league have worked with success for their proper enforcement. The remarkable wave of prohibition which swept over the Southern States in the first years of the twentieth century received its impetus largely from the work of the league. See PROHIBITION. The *Anti-Saloon Year Book* gives an annual summary of the work of the league.

ANTISANA, ä'n'tê-sä'nà. A volcanic peak of the Andes in Ecuador, about 40 miles southeast of Quito, and over 19,000 feet high (Map: Ecuador, B 3). Signs of volcanic activity appeared in 1803 during the eruption of Cotopaxi. Tambo de Antisana, one of the highest settlements on the globe, is on a slope of the Antisana at an elevation of over 13,000 feet.

AN'TISCORBU'TICS. See SCURVY.

ANTI-SEMITISM (*anti* + *Semites*, i.e., Jews). A movement having for its object the exclusion of Jews from posts of political honor or of social prominence. In its extreme form Anti-Semitism seeks ultimately to expel the Jews from the nation, on the ground that they represent a non-assimilable element, exerting a pernicious influence upon the social order. In its inception modern Anti-Semitism was essentially social and economic, and questions of religion had little to do with it. With the progress of the Anti-Semitic agitation, however, the most effective popular attack on the Jew was based

upon his religion. In the Anti-Jewish riots that have occurred in Russia, Austria, Rumania, and Germany the religious element has been prominent, although social aversion and conflicting economic interests have also been in evidence. Anti-Semitism first assumed the proportions of a social movement in Germany about 1879. A political party organized in Berlin sought to place Jews under political disabilities. The leaders of the party were Stöcker, court preacher of Prussia and a Christian Socialist; Professor Treitschke, of the University of Berlin, an historian and deputy in the Reichstag; and Dr. Dühring, author of treatises on history and philosophy. Throughout 1879 and 1880 these men, through the press and in speeches, carried on an active Anti-Semitic propaganda based on social and economic grounds. The matter was brought to a vote in the Reichstag in 1880; but that body declared itself in favor of economic and religious liberty by a decisive vote. The Anti-Semitic Party became a strong one in the Reichstag, however, in the early nineties. Since that time its influence in German politics has been inconsiderable. In France the Anti-Semitic propaganda was begun by Edward Drumont, editor of *La Libre Parole*, about 1882, and reached a climax in the *affaire Dreyfus*. See DREYFUS.

Since its organization in Germany the Anti-Semitic Party has been organized in Russia, Austria, Greece, and Holland. As the Jews in Russia are to a great extent kept out of the ordinary trades, many of them have resorted to the business of money lending, and by means of mortgages placed to secure loans they have obtained control of small landed properties. This fact, coupled with religious prejudice, caused the Anti-Semitic movement in Russia, about 1881, to assume a most violent form. Laws preventing them from entering professions and from living in places other than towns and hamlets were vigorously enforced. In some cities, where a majority of the people were Jews, they were expelled without warning. The Anti-Semitic agitation led in April, 1903, to a terrible massacre of Jews at Kishinev in southern Russia; in 1905 and 1906 sporadic attacks upon the Jews, resulting in loss of life and destruction of property, occurred in various Russian cities. The persecution of the Jews in Russia and Rumania has caused an emigration on a vast scale, especially to the United States and South Africa. Consult Lazare, *Anti-Semitism* (New York, 1903). See JEWS.

AN'TISEP'TIC (*anti* + Gk. *σήπειν*, *sēpein*, to make rotten, to cause decay). In the arts, any substance which arrests fermentation and decay; in medicine, any agent which arrests the development and growth of micro-organisms. A *germicide* is a substance or agency which destroys these micro-organisms. A *disinfectant* destroys the organisms and at the same time removes the noxious products of fermentation and putrefaction. The conditions which favor putrefactive change are a moderate degree of warmth, air, and the presence of moisture and micro-organisms. Measures which tend to limit the action of any of these agencies are antiseptic in character. Cold acts as an antiseptic, by bringing the article to be preserved to a temperature at which the putrefactive bacteria can no longer act. In the preservation of canned goods another principle is employed, that of exclusion of air. The cans, with their contents, are heated, and when all air has been expelled

the tops are soldered on. The principle of excluding moisture is employed in the processes of drying meats, fruits, and vegetables. The action of micro-organisms is often combated directly by the introduction into preserved foodstuffs of such antiseptic substances as boric and salicylic acids and formaldehyde. They are considered injurious, however, and their use is forbidden by law in many States. Besides the antiseptics proper, a number of the more common substances, such as common salt, sugar, alcohol, and saltpetre, are used in food preservation. Antiseptics are used for other purposes besides the preservation of foodstuffs. Thus the preservation of sizes used in paper-making is effected by the addition of sulphurous acid, and the preservation of the commercial gums and pastes by carbolic acid and oil of wintergreen. The preservation of wood from decay by impregnation with tar, creosote, and carbolic acid is also practiced to some extent.

In scientific laboratories antiseptics like alcohol and formaldehyde are largely employed in the preservation of anatomical and biological specimens. In surgery the application of antiseptics, first introduced by Sir Joseph Lister, is a matter of greatest moment. It is an understanding of the use of antiseptic and germicidal agencies that has brought about the remarkable advances made by this branch of the healing art since 1880. The condition that is sought for in every surgical operation to-day is *asepsis*, or surgical cleanliness. When a substance is *aseptic*, it is free from all septic micro-organisms. Instruments are rendered aseptic or sterile by boiling in water, by dry heat, by steam, by washing with the chemical antiseptics, or by exposing them to moist formaldehyde vapors; dressings, by dry heat or by steam at ordinary atmospheres or under pressure; ligatures, by prolonged immersion in alcohol or other antiseptic solutions; and the skin of the patient at the site of the operation, by application, after mechanical cleansing, of a solution of iodine or corrosive sublimate. The chemical substances most commonly employed as antiseptics in medicine are carbolic acid, the bichloride of mercury, peroxide of hydrogen, formaldehyde, free chlorine, iodine, potassium permanganate, iodoform, and boric acid, and to a lesser extent the vegetable substances thymol, menthol, and eucalyptol. See BACTERIA; MICROBE; KOCH, ROBERT; PASTEUR; WOUND.

AN'TISLAVERY SOCIETY, THE AMERICAN. An association organized in Philadelphia, December, 1833, by delegates from the few State or city societies in the United States. The first Antislavery Society was formally organized at Boston in January, 1832, William Lloyd Garrison being the leader of the movement. The American Antislavery Society took the boldest ground in favor of the immediate abolition of slavery, and its work was for many years looked upon as fanatical or at least hopelessly impracticable, its members were denounced, its meetings broken up, and rewards offered in the South for its leaders alive or dead. Divergence of opinion on the question of political action caused a split in the society in 1840. The non-voters under Garrison, although but a small portion of the Abolitionists, gained control of the old society. The others formed the American and Foreign Antislavery Society, but the movement had outgrown a society formation and found a better and more conservative expression in the

Liberty Party (q.v.) and its successors. Among the prominent Abolitionists were William Lloyd Garrison, Wendell Phillips, Samuel J. May, Lucretia Mott, Lydia Maria Child, Arthur Tappan, James G. Birney, John G. Whittier, William Goodell, Gerrit Smith, and William Jay. The parent society continued to exist, until after the adoption of the fifteenth amendment, in 1870, remaining small in numbers but largely influential in its propagandist work. For a partial bibliography of the movement, see the biographical sketches of the leaders here mentioned. See ABOLITIONISTS; SLAVERY.

AN'TISPASMOD'IC (*anti* + Gk. *σπασμός*, *spasmos*, convulsion, spasm). Any drug that has a sedative effect upon the nervous system, either by depressing the brain or spinal cord or by stimulating inhibitory centres, and so regulating the production of nerve force. The former class includes the bromides and chloral. The stimulating antispasmodics are asafetida, belladonna, camphor, Hoffman's anodyne, musk, and valerian. As a class, they are employed in conditions of nervous excitation, particularly of a hysterical nature, in asthma, alcoholism, and in convulsions from epilepsy or other causes.

ANTIS'THENES OF ATH'ENS (born about 450 B.C.). A rhetorician, but later a philosopher and the founder of the Cynic school of Greek philosophy. He was son of Antisthenes, an Athenian, and a Thracian slave-woman. He studied under the Sophist Gorgias, and was a disciple and ardent follower of Socrates; he plays a large rôle in the "Symposium" of Plato. He wrote a large number of philosophical works, in Greek much praised by ancient critics for its purity, and for many years taught elocution and philosophy, in the gymnasium outside Athens known as the Cynosarges; from the name of this gymnasium, perhaps, came the name Cynics (q.v.), which was given to his followers. Antisthenes regarded freedom and happiness as attainable only through virtue; but the meaning of his doctrine is ambiguous until the definition of virtue is given. In this Antisthenes followed Socrates's eudæmonistic principles. For Antisthenes, however, virtue was not in doing good for its own sake; the object of virtue was to render man as independent as possible of the events of life, and this freedom was attainable by reducing the wants of life to what is absolutely inevitable, viz., the wants of hunger and love. Customary morality and the demands of decency, as well as the pleasures of life, both material and intellectual, were ridiculed by Antisthenes and his followers and denounced as depriving man of his freedom, and, hence, as leading to nothing but unhappiness. Nevertheless, the Cynic was not inconsistent when he advocated a philosophic culture; but this culture was to be looked upon as a means, and not as an end; it was desirable not for its own sake, nor for the sake of the intellectual pleasure which it could afford, but as leading our intelligence to avoid consistently the artificial enjoyments of civilized life. Two declamations ascribed to Antisthenes were edited by Friedrich Blass in 1871, but most scholars decline to believe that they were written by Antisthenes. Consult T. Gomperz, *Greek Thinkers* (Eng. trans., vol. ii, 1905).

ANTISTROPHE, *än-tis'trô-fê* (*anti* + Gk. *στροφή*, *strophê*, a turning, strophe, stanza). A stanza or portion of a poem following the strophe, and responding to it. It results also

when the same word or phrase is used at both the beginning and the end of a clause or sentence; as in

"Fare thee well; and if forever,
Still forever fare thee well."

ANTITH'ESIS. See RHETORIC, FIGURES OF.
AN'TITOX'IN (*anti* + *toxin*; Gk. *τοξικόν*, *toxikon*, poison for the arrow, from *τόξον*, *toxon*, bow). During the course of diseases caused by bacterial infection, certain poisons (toxins) are developed in the blood by the bacteria, or exist in the bodies of the bacteria. Nature, in combating the disease, produces certain principles in the serum of the blood of the patient, called antitoxins, which antagonize the action of the toxins. These principles have not been isolated, but they are used to combat disease artificially by injecting blood serum which contains them into the tissues of a person suffering with a bacterial disease, to aid him in neutralizing the toxins resulting from that disease. Antitoxins combating the poisons of tetanus, cerebro-spinal meningitis, snake-bite, pneumonia, tuberculosis, yellow fever, bubonic plague, cholera, and other ailments have been prepared and used. The one most often employed is diphtheria antitoxin, which is frequently called simply antitoxin. See ANAPHYLAXIS; BACTERIA; DIPHTHERIA; SERUM THERAPY.

ANTI-TRADE' WINDS. See WINDS.

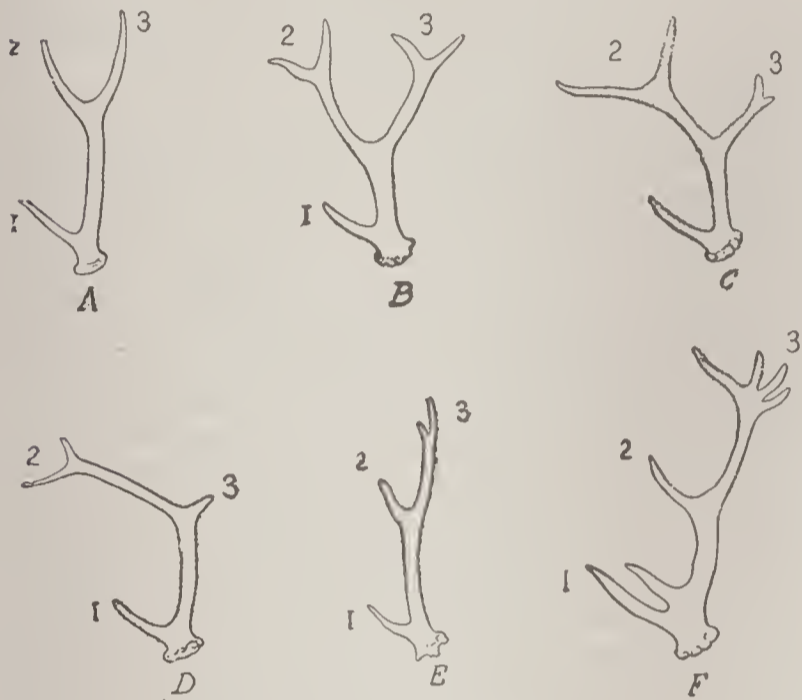
AN'TITRIN'ITA'RIAN (*anti* + *trinitarian*, from Lat. *trinitas*, triad, trinity). One who denies the doctrine of the Trinity. An Antitrinitarian differs from a Unitarian only in this respect, that his objection to the doctrine in question is made on philosophical, while that of the latter is made on theological, grounds.

AN'TITYPE (*anti* + *type*; Gk. *τύπος*, *typos*, an impression, model, pattern). The fulfillment of the type. Thus, David is often regarded as a type of Christ, who is, therefore, the antitype; the sacrificial offerings of the Old Testament types of Christ, and he is their antitype. See TYPE.

ANTIUM, *än'shī-üm* (now Anzio, formerly Porto d'Anzio). One of the most ancient cities of Latium. It stood on the coast, about 34 miles from Rome, and, being favorably situated for commerce and piracy, was, under the Volscians, into whose hands it had fallen, one of the most powerful enemies of rising Rome, until finally subdued (338 B.C.). All its ships were at this time taken from the town, and their beaks (*rostra*) were set up on the speaker's platform in the Forum, hence known as the Rostra. It became a favorite resort of the wealthy Romans, and some of the most famous remains of ancient art have been discovered among the ruins of their villas and palaces, such as, perhaps, the "Apollo Belvedere" (see APOLLO BELVEDERE) in the Vatican, and the "Borghese Gladiator" in the Louvre. (See AGASIAS.) In 1878 a statue, long known as the Maiden of Anzio, was discovered there, within the villa of Prince Ludovico Chigi; in December, 1909, the Italian government paid nearly \$90,000 for this statue and set it up in the Museo delle Terme, in Rome. Since that time many have maintained that the statue was rather that of a youth: see *The Classical Weekly*, vol. iii, pp. 146-147 (New York, 1910), and for the opposite view, that it portrays a maiden, a prophetess, see the same periodical, vol. iii, pp. 180-181. It was the birthplace of the emperors Caligula

and Nero, and the latter constructed a splendid port by means of two moles inclosing a basin two miles in circumference. Remains of the moles still exist, although the basin is mostly filled up with sand. In the ninth and tenth centuries the town was made desolate by the raids of the Saracens. Its site is now occupied by Anzio, a favorite bathing resort for the inhabitants of Rome, with some charming villas.

ANT'LEERS (OE. *auntlere*, OF. *antoiller*, from Lat. *ante*, before + *oculus*, eye). The horns of (male) deers. For their structure, etc., see DEER. In the language of British stag-hunting, each part of the horn and each stage of growth receives a name, and many of these names serve to designate a deer of a certain age or fitness. These names are derived from and



TYPES OF ANTLERS.

A, Rusine. B, Normal rucervine. C, Intermediate rucervine. D, Extreme rucervine. E, Sub-elaphine. F, Elaphine. 1, Brow-tyne. 2, Tres-tyne. 3, Royal-tynes.

specifically apply to the European red deer (*Cervus elephas*), now preserved in many parts of Europe for the sport of stag-hunting; and they have descended from ancient terms, mostly French, originating on the Continent in mediæval times. The following is a summary given by Prof. A. H. Garrod in *Cassell's Natural History*, vol. iii:

"In the common red deer, in the spring of the year following its birth, the antlers are nothing more than straight, conical, and unbranched 'beams,' the animal being then known as a 'brocket.' In the following spring the antler has, besides the 'beam,' a small branch from its base, directed forward, known as the 'brow antler'; it is then termed 'spayad.' In the third year an extra front branch is formed, known as the 'tres,' and the whole antler is larger. The tres is sometimes seen in the smaller antler of the spayad. In the fourth year the brow antler is doubled to form the 'brow' and 'bez-tyne,' at the same time that the top of the main beam divides into the 'sur-royals' of the 'staggard,' or four-year-old male. In the fifth year the sur-royals become more numerous, the whole antler of the 'stag' being heavier than previously, only to be exceeded in weight by those of the fully adult 'great hart' with ten or more 'points,' each being larger and longer than the year before."

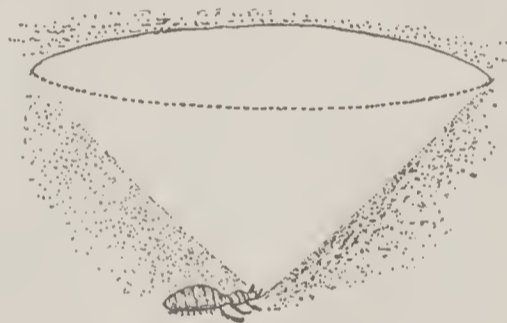
In Scotland a deer with twelve points is known as a "royal stag"; but this number is sometimes exceeded. The finest heads are no

longer seen in Great Britain, where the habit of shooting the best is leading to deterioration, and fossil antlers from British caves and peat-beds are larger than those of any living individuals, rivaling those of the wapiti in size. Great heads have been obtained within recent years on the vast wild estates of eastern Europe. In many of the old German castles superb heads of sixty or more points are preserved; and Lydekker mentions one shot in Transylvania which had forty-five points and weighed 74 pounds. It should be said, however, that this excessive number of points is the result of injury or disease when the horn was growing, so that a large, symmetric pair with more nearly the normal number of tines is a really better example.

The material of antlers is highly durable, and enters extensively into the arts for making handles of knives, umbrellas, etc., and various ornamental articles.

ANT'LIA PNEUMAT'ICA, or the **AIR-PUMP**. A southern constellation, defined by Lacaille in 1752 and situated between the constellations Argo and Hydra. It contains no large stars.

ANT'-LI'ON. The larva of any insect belonging to the neuropterous family Myrmeleonidæ. The kinds commonly referred to are only those which form pitfalls, and not the members of the family in general, all of which do not possess this habit. The conical pitfalls which



ANT-LION.

Showing the conical Pit with the Larva waiting for its Prey.

are used to aid in the capture of ants and other small ground insects are excavated in sand, dust, and the powdered remains of decayed logs. Their size varies with that of the ant-lion, but they are commonly about one and one-half inches across the top. There are two methods used in the formation of these traps. The simplest trap is excavated by powerful upward tossings of the head after the larva has buried itself below the surface; thus, a funnel-shaped pit is formed. The second method is by crawling backward in a spiral direction just beneath the surface, and by means of the head tossing the sand to the outside. In the bottom of these conical pits the larvæ bury their whole body except their mandibles, which are spread ready for their prey. An ant, for example, strolling about and stepping on the margin of the pit starts a miniature land-slide on account of the looseness of the material in which the pit is excavated. This arouses the ant-lion, which begins actively to throw material from the bottom of the pit, thus accelerating the landslide and bringing the ant within reach of the jaws, which seize it and relax only after extracting the juices from the body. The scissors-like jaws are grooved on their inner side, and thus by opposition a tube is formed through which the juices are sucked. The carcass, extracted of its

juices, is tossed outside of the pit. The posterior part of the intestine of the ant-lion is remarkable for being modified to form a spinning gland or organ. The adult ant-lion spins a cocoon by the aid of sand, etc., in which it transforms to the imago state. The "flies" have four expanded net-veined wings, which are folded over the abdomen when at rest. In most of the species the wings are transparent. About fifty species are found in the United States, most frequently in sandy or semi-arid regions.

ANTOFAGASTA, ä'n'tô-fâ-gäs'tâ. A northern province of Chile, bounded on the north by the province of Tarapacá, on the east by the republic of Argentina, on the south by the province of Atacama, and on the west by the Pacific Ocean. It has an area of 46,609 square miles. Taking in a large part of the Atacama desert, the surface is mostly mountainous and barren and interspersed with salt lagoons and marshes. It contains a number of volcanoes and has large deposits of silver, lead, iron, manganese, borax, guano, and saltpetre, much of which is mined and exported. Notwithstanding the phenomenal increase in the population of the province between 1885 and 1910 (from 21,213 to 118,718) on account of new mineral discoveries, Antofagasta is still one of the most sparsely populated provinces of Chile, its density being 2.6 to the square mile. This territory was ceded to Chile by Bolivia as a result of the war ending in 1883. The capital and chief seaport is Antofagasta.

ANTOFAGASTA. A port and the capital of the Chilean province of the same name (Map: Chile, C 8). Founded in 1870, it increased rapidly in importance, owing to the saltpetre deposits in the neighborhood and to the rich silver mines of Caracoles and Huan-chaca, with which it is connected by railway. Among the imports are hardware, machinery, drugs and medicines, and cotton fabrics. Antofagasta is about 3000 miles from Panama. Pop., 1885, 7600; 1907, 32,496; 1910, 36,000.

ANTOINE, ä'n'twän', ANDRÉ (LÉONARD) (1851—). A French theatrical manager, born at Limoges. He was for several years a clerk with the Paris Gas Co., but his chief interest came to be in the stage. In 1887 he founded in Paris the Theatre Libre, known also as the Theatre Antoine, an enterprise in which he showed a remarkable skill in the production of plays. He became co-director of the Odéon Theatre in Paris in 1896, and director ten years later. Here he produced many successful plays by modern authors and revived many of the plays of French and foreign writers, including Shakespeare. He was made a Chevalier of the Legion of Honor and an officer of public instruction.

ANTOINE, JULES DOMINIQUE (1845—). One of the principal representatives of the opposition party in Lorraine. He was born at Metz and served in the Franco-German War as officer of the *Garde Mobile*. After the war he became prominent in Metz as an exponent of the Anti-German sentiment in the Municipal Council and the local diet. In 1882 he was elected representative to the Reichstag, but after a fruitless attempt to deliver an address in French before that body, abstained almost altogether from attending the sessions. He was reelected by his constituents in 1884 and in 1887. He was tried for treason and sentenced to permanent exile (1889), whereupon he became a naturalized citizen of France, being made Paymaster-General in 1893.

ANTOINE DE BOURBON, ä'n'twän'de böör' bôn' (1518-62), King of Navarre. He was born in Picardy, the son of Charles of Bourbon. In 1548 Antoine, then Duke of Vendôme, married Jeanne d'Albret, the heiress of Navarre, and through her became King of Navarre and Lord of Béarn (1555). He was feeble and irresolute and fluctuated between the two religious parties in France. At the beginning he sided with his brother Louis, Prince of Condé, and was involved in the conspiracy of Amboise, but in 1561 he was made Lieutenant-General of France and, embracing Catholicism, soon formed a coalition with the Duke of Guise and the Constable of Montmorency. He received command of the royal army besieging Rouen and there met his death in an assault on the city (Nov. 17, 1562). Antoine de Bourbon is best known as the father of Henry of Navarre, who became Henry IV of France. See BOURBON, HOUSE OF.

ANTOKOLSKI, ä'n'tô-kôl'skê, MARK MATVEYEVITCH (1843-1902). A Russian sculptor of Jewish parentage. He was born at Vilna and studied in St. Petersburg Academy of Fine Arts. His earliest successes were a wooden statue "The Jewish Tailor" (1864), "The Miser" (1865) in ivory, which obtained him an imperial pension, and the marble "Kiss of Judas" (1867). In 1868 he received a stipend for traveling, and while in Italy he completed his famous statue, "Ivan the Terrible," which made him an academician. The Emperor Alexander II bought the statue and ordered a bronze cast, now in Alexander III Museum; a marble copy is in the Hermitage at St. Petersburg. Among other sculptures of the artist are: "Peter the Great" (1872, a colossal marble figure); "Christ before the People" (bronze, 1874); "The Death of Socrates" (1876); "The Last Sigh" (1878); "Spinoza" (1882); "Yermak" (the Cossack conqueror of Siberia); "The Sleeping Beauty" (1900), and a portrait statue of the novelist, Turgenieff. Most of the above sculptures are in the new Alexander III Museum, St. Petersburg. Among his portraits of the imperial family are the bronze statue of Alexander II at Moscow and that of Alexander III in the Kremlin. At the Paris International Exposition of 1878 Antokolski was awarded the first prize for sculpture, and two years afterward he settled permanently in Paris. He was a Chevalier of the Legion of Honor, corresponding member of the Académie des Beaux-Arts, etc. His art is characterized by powerful realism and energy of expression.

ANTOMARCHI, ä'n'tô-mär'kê, FRANCESCO (1780-1838). The physician of Napoleon at St. Helena. He was born in Corsica, studied medicine at Pisa, and afterward practiced in the Santa Maria Hospital at Florence. At the request of Napoleon's mother he was induced by Cardinal Fesch to succeed Dr. O'Meara as the attendant physician of the Emperor at St. Helena. At first there was little cordiality between the two; but subsequently Napoleon conceived a high regard for his countryman and at his death left him 100,000 francs. The physician afterward declared that the death of Napoleon had not been caused by cancer of the stomach, but by a malignant fever peculiar to the island, and he refused to sign the *post-mortem* certificate. In 1830 Antomarchi displayed what he represented to be a death mask of Napoleon. The likeness was considered ac-

curate by many, but the phrenologists found fault with the contour of the cranium, and doubt was cast upon the genuineness of the mask. Nevertheless, it forms the model from which many busts of Napoleon have been made. At the outbreak of the Polish revolution, in 1830, Antomarchi went to Warsaw and soon afterward returned to France, whence, in 1836, he proceeded to America. He died at Santiago, Cuba. He published *Les derniers moments de Napoléon* (Paris, 1823; London, 2d ed. of Eng. trans., 1826).

ANTONELLI, ä'n'tò-nè'l'lé, GIACOMO (1806-76). An Italian Cardinal and statesman, born at Sonnino. At the Seminary in Rome he became conspicuous for intellectual capacity, and Pope Gregory, recognizing his ability, attached him to his suite. He became Under-Secretary in the Ministry of Interior in 1841, and in 1845 Minister of Finance. At the accession of Pius IX he joined the Pope's reformatory schemes and gained great influence, becoming Cardinal in 1847 and a member of the Ministerial Council through which Pius undertook to establish his reforms. In 1848, when the ministry of priests and laymen was established, Antonelli became Prime Minister. After the Pope's pronouncement against the war with Austria (1848), Antonelli resigned, but afterward, when he had perceived the Pope's motive, he abandoned his national policy and associated himself entirely with the conservative element. Upon the reestablishment of the papal power through the intervention of France, Antonelli returned to Rome with the Pope (1850) and reorganized the administration along strictly absolutistic lines. He rejected all advances of the Powers recommending opportunistic reforms and would not yield to the nationalistic aspirations of the Italians. He raised vain protests against the aggrandizement of the royal territories at the expense of the Papal States. During the closing years of his life he lost his influence with the Pope, who yielded more and more to the Jesuit element. At his death he was Prime Minister to the Pope. A deficit of 45,000,000 lire was discovered in the Vatican finances at this time. He left his property, amounting to about \$8,000,000, to his three brothers, and his alleged daughter, the Countess Lambertini, vainly sued for a share. Consult Pillon de Thury, *Biographies des cardinaux* (1862).

ANTONELLO DA MESSINA (c.1430-79). A Sicilian painter of the Renaissance, famed as the introducer of oil painting into Italy. On the basis of Vasari's assertions he was said to have studied in Flanders and to have brought the oil technique to Venice, with whose school he is generally classed. But documents recently discovered by Dei Marzo and La Corte-Cailler show that he was born 1430 (not 1447) in Messina. Here he lived and practiced certainly till 1465 and probably until 1474. In 1475-76 he was in Venice, where he painted the lost altar-piece of San Casciano, which exercised a profound influence upon Venetian art. During the latter year he was also in the service of the Duke of Milan, and in 1478 he again appears in Messina, where he died the middle of February, 1479. There is no reason to assume that he visited Flanders, for in Naples, where he probably studied, Flemish influence was predominate and the oil technique was practiced. To his earliest period belongs a "Salvator Mundi" (1465) in the National

Gallery, London; to the second a triptych in the gallery of Messina (1473), representing the Madonna dell' Rosario with saints, a portrait of a young man in the Berlin Gallery, and an "Annunciation" in the Palazzo Acreide (Syracuse). To the Venetian period belong the remarkable portrait of a condottiere in the Louvre (1475), a "Crucifixion" in the Antwerp Gallery, the portraits of the young men in the Trivulzio Gallery, Milan, the Borghese Gallery, Rome, and National Gallery, London (1476). Among his undated pictures are a beautiful St. Sebastian in the Dresden Gallery and a St. Jerome in London, both probably belonging to his last period.

Antonello was the only great painter of the Renaissance in south Italy. His reputation was as great among his contemporaries as in modern times. The chief characteristics of his art are a trenchant realism, strong characterization, and wonderful color. Consult: Morelli, *Italian Painters* (London, 1892); Beltrami, *Archivio storico dell' arte*, vii; the monographs on Antonello by Di Marzo (Palermo, 1903), La Corte-Cailler (Messina, 1903), and D'Amico (Messina, 1904); L. Venturi, *Le origine della pittura veneziana* (Venice, 1907).

ANTONIA MAIOR (39 B.C.-?). The elder of the two daughters of Mark Antony and Octavia, and grandmother of the Emperor Nero. Her son, C. Domitius, was Nero's father. Her husband was L. Domitius Ahenobarbus.

ANTONIA MINOR (c.36 B.C.-38 A.D.). Sister of Antonia Maior, mother of the Emperor Claudius and of Germanicus the great general, and grandmother of Caligula. Her husband was Drusus, brother of the Emperor Tiberius. Caligula at first treated her with respect, but afterward subjected her to indignities.

ANTONIDES, ä'n-tò'nè-däs, JOANNES (1647-84). A Dutch poet. He was born in Goes and was educated at the expense of one of the chiefs of the admiralty at Amsterdam. He was the foremost pupil of Vondel, whom he resembled in poetical ability, although his works are marred by turgidness and monotony. He is best known by his poems, and a tragedy written at the age of 19, called *Trazil of overrompelt Sina* ("The Conquest of China," 1866). His fame was fully established by the publication, in 1671, of *Ystroom*, an epic on the river Y.

ANTONI'NA (449-c.565). The wife of the Byzantine general Belisarius. Though the daughter of a circus-rider, she was a favorite of Theodora, the wife of Justinian, and through the influence of the Empress reduced Belisarius to a state of servile submissiveness and impelled him to many acts of injustice. In connection with his public career, however, she frequently showed great foresight and diplomacy. See BELISARIUS.

ANTONINE COLUMN. The column of Marcus Aurelius in Rome. It was erected in 176 A.D. to commemorate that Emperor's victories in his German and Sarmatian wars. The column stood in a square surrounded by a portico and was part of a superb group of monuments to commemorate the Antonine dynasty, similar to the column of Trajan, which it imitated, having the same height (100 feet), and reliefs similarly arranged in ascending spirals, giving the history of the campaigns. It now adorns the Piazza Colonna.

ANTONINES, AGE OF THE. The period in Roman history marked by the reigns of Anto-

ninus Pius and Marcus Aurelius Antoninus (A.D. 138-180). It was noted for its peace and prosperity.

AN'TONI'NUS. The name of several Roman Emperors, who are to-day generally distinguished by their titles or nicknames. See ANTONINUS PIUS; AURELIUS; CARACALLA.

ANTONINUS, ITINERARY OF (Lat. *Antonini Itinerarium*). A valuable geographical work, containing the names of all the places and stations on the principal and cross-roads of the Roman Empire, with their distances from one another in Roman miles. It has been usually attributed to the Emperor M. Aurelius Antoninus (Caracalla), whence its name. The testimony, however, of the Greek geographer Æthieus, author of the *Cosmographia*, assures us that a general survey of the Roman Empire was commenced 44 B.C., in the consulship of Julius Cæsar and M. Antonius, and completed in the reign of Augustus, when the results of the survey received the sanction of the State. These results, it is with some probability inferred, are embodied in this *Itinerary*, which, it is further supposed, received additions and amendments in the time of the Antonines. Subsequent improvements went down to the reign of Diocletian. The best editions are those of Wesseling (Amsterdam, 1735) and Parthey (Berlin, 1848). Consult D'Urban, *Recueil des itinéraires anciens*, with 10 maps (Paris, 1845).

ANTONINUS, MARCUS AURELIUS. See AURELIUS, MARCUS ANTONINUS.

ANTONINUS, SAINT (1389-1459). An Archbishop of Florence. His real name was Antonio Pierozzi, and he is also known by the name of De' Foreiglioni. At first prior to several monasteries, he was, in 1446, appointed to the archbishopric of Florence, where his noble efforts tended greatly to alleviate the sufferings attendant upon the pestilence, famine, and earthquake of the period 1448-53. He was canonized by Pope Adrian VI in 1523. The 2d of May is consecrated to his memory in the Roman Catholic church. The most important of his writings are: *Summa Theologica Moralis, Partibus IV Distincta* (1477), a compilation of ethical precepts after Thomas Aquinas, which went through 15 editions in the first 50 years; *Summa Confessionalis*; *Summa Historialis*, a chronicle; and *Lettere* (1859). A monument to him was erected in Florence, and his cell in the monastery of St. Mark's is still pointed out.

ANTONINUS, WALL OF (Lat. *Antonini vallum*). See ROMAN WALL.

ANTONINUS AND FAUSTI'NA, TEMPLE OF. A prostyle temple in Rome, facing the Sacred Way, on the north side of the Forum (q.v.), voted by the Senate in 141 A.D., in commemoration of the elder Faustina, wife of Antoninus Pius, who died in that year and was deified. (See APOTHEOSIS.) Antoninus's own name was added to that of his wife on his death in 161 A.D.; together they were the patron deities of the temple. The temple has six unfluted columns in front and three on the sides. The frieze is richly sculptured. Before the twelfth century the temple was dedicated to St. Laurence under the title of San Lorenzo in Miranda. Urban V used much of its material in the reconstruction of the Lateran. Consult Huelsen, *The Roman Forum* (Rome, 1906); Platner, *The Monuments and Topography of Ancient Rome* (New York, 1911).

ANTONINUS LIB'ERA'LIS. A Greek

writer on mythology, who lived about 150 A.D. and is supposed to have been a freedman of Antoninus Pius. He wrote in prose *Μεταμορφώσεων συναγωγή* (*Metamorphōseōn Synagōgē*), a collection of 41 myths dealing with transformations. Most of these are derived from ancient sources, now lost, so that the work is valuable.

ANTONINUS PI'US; TITUS AURELIUS FULVUS BOIONIVS ARRIUS (86-161 A.D.). A Roman Emperor (138-161 A.D.) who was born at Lanuvium in the reign of Domitian. His family was originally from Nemausus, now Nîmes, in Gaul. He was brought up by his maternal grandfather, Arrius Antoninus, a righteous and cultured man. He inherited great wealth and early gave proof of excellent qualities. In 120 he was made consul; afterward he was sent by Hadrian as proconsul into Asia, where the wisdom and gentleness of his rule won him a higher reputation than had been enjoyed by any of his predecessors. By his wife, Faustina, he had four children, of whom three died, leaving a daughter, Faustina, afterward wife of Marcus Aurelius. In 138 he was adopted by the Emperor Hadrian, in consequence of merit alone, and came to the throne in the same year. The reign of Antoninus Pius was peaceful and happy. In his private character he was simple, temperate, and benevolent, while in public affairs he acted as the father of his people. The persecution of the Christians, which was continued during his reign, was partly stayed by his mild measures. He was little engaged in war, except in Britain, where he extended the power of Rome and built a wall between the Forth and the Clyde, as a defense against invasions by the predatory inhabitants of the north. (See ROMAN WALL.) The reign of Antoninus Pius illustrates the saying, "Happy the nation which has no history," for by the justice, wisdom, kindness, and courtesy of the Emperor his vast Empire was preserved from the crimes, conspiracies, insurrections, and bloodshed, the recording of which formed the largest part of the historian's work in the dark centuries of the Roman Empire. It is said that only one Senator was impeached during the lifetime of Antoninus Pius. Literature received great encouragement; the laws were improved, commerce extended; the means of communication were facilitated by the repair of roads, bridges, etc.; new sanitary regulations were introduced, and a taste for architecture fostered in the citizens. The epithet Pius, 'dutiful,' was conferred on him on account of his conduct in defending the memory of his predecessor, Hadrian, against certain dishonoring charges brought forward by the Senate. The column raised to his memory by his adopted son and successor, Marcus Aurelius Antoninus (q.v.), was discovered in 1709, but exists only in fragments. For the column now in the Piazza Colonna at Rome see ANTONINE COLUMN. See also FAUSTINA.

ANTO'NIO. 1. The Changeling in Middleton's play of the same name. 2. The steward in Webster's *Duchess of Malfi*. 3. The Duke of Milan in Shakespeare's *Tempest*. 4. The Merchant of Venice in Shakespeare's play of the same name, who, unable to repay money borrowed of the Jew Shylock, becomes liable for the stipulated forfeit, a pound of flesh.

ANTONIO, an-tō'nē-ō, NICOLAS (1617-84). A Spanish bibliographer and critic. In 1654 Philip IV made him his general agent at the court of Rome for the kingdoms of Spain and

Two Sicilies and the Duchy of Milan. There he remained nearly 20 years and employed most of his time on his great work, which was a list, as nearly complete as possible, of Spanish authors and their writings, from the time of Augustus down to his own day. He published part of it at Rome in 1672, under the title, *Bibliotheca Hispana Nova*, in two volumes, treating authors from the year 1500 to 1670; and in 1696 there appeared, also at Rome and in two volumes, his *Bibliotheca Hispana Vetus*, which begins with the reign of Augustus and closes with the year 1500. About 1677 he was fiscal for the Royal Council in Madrid. His *Bibliotheca Hispana* is considered by some critics the most comprehensive work on Spanish literature. There was an edition of Madrid, 1783, annotated by Gregorio Mayáns y Siscar; but the most available edition is that of Madrid, 1788, in four volumes. He also wrote a critique on fabulous histories (Valencia, 1742). Consult Menéndez y Pelayo, *La Ciencia española* (Madrid, 1887); Haebler, *Biblioteca ibérica del siglo XV* (Paris, 1906).

ANTONIO DE SEDILLA, dā sā-dē'lyá (c.1730–1829). A Spanish missionary priest, better known as 'Père Antoine.' In 1779 he was sent to New Orleans to reinaugurate the Inquisition there, but was immediately sent back by Governor Miro, who felt that the enforcement of Spain's rigid laws against heretics would precipitate a revolution. Père Antoine returned to New Orleans in 1783 as priest of the St. Louis Cathedral and by his kindness and his numerous charities earned the love of the residents, especially of the French element. Until 1886 a palm tree planted by him was a landmark in New Orleans, and about it clustered many picturesque traditions, some of which are given in Gayarré, *History of Louisiana* (3 vols., New York, 1846–53). Consult T. B. Aldrich's story, *Père Antoine's Date Palm*, and Arthur Phelps, "Louisiana," in the *American Commonwealths series* (Boston, 1905).

ANTO'NIUS, GAIUS, surnamed HYBRIDA. A Roman consul, son of Marcus Antonius the orator, and uncle of Mark Antony. He was Cicero's colleague in both the prætorship (65 B.C.) and the consulship (63). He was regarded at first as one of Catiline's conspirators, whether rightly or wrongly we cannot say. Cicero, to whom his attitude seems to have given some concern, secured for him the province of Macedonia and so won him completely to his own side. On his return to Rome (59), he was accused of having taken part in Catiline's conspiracy and of extortion in his province, and, though defended by Cicero, was condemned on both charges. He then retired to the island of Cephallenia, but was recalled, probably by Cæsar, and was in Rome at the beginning of 44 B.C.

ANTONIUS, MARCUS (143–87 B.C.). One of the most eloquent of Roman lawyers and speakers, commonly called "the Orator." He was the grandfather of Mark Antony, the triumvir. He was prætor in 104 B.C., and the following year governor (*legatus pro prætore*) of Cilicia; in 99 he held the consulship. He favored the aristocratic party, and was an adherent of Sulla in the Civil War against Marius, by whose order he was assassinated. In the judgment of Cicero, Antonius and L. Crassus were the first Roman orators who equaled the great speakers of Greece. Both are interlocutors in Cicero's *De Oratore*. Consult the Intro-

ductions to editions of Cicero's *Orator* and *De Oratore*, by J. E. Sandys and A. S. Wilkins respectively (Cambridge, 1885; Oxford, 1888).

ANTONIUS, MARCUS (83–30 B.C.). A famous Roman, commonly known as Mark Antony, a descendant of one of the oldest patrician families. He was grandson of the orator Antonius (q.v.), and the son of the prætor, M. Antonius Creticus; on the side of his mother, Julia, he was related to Julius Cæsar. He wasted his youth in dissipation and, finding himself pressed by numerous impatient creditors, escaped to Greece in 58 B.C., where for a short time he listened to the teaching of Athenian philosophers and orators. His studies here were soon interrupted by the pro-consul Gabinius (q.v.), who appointed him leader of his cavalry. In the campaign against Aristobulus II (q.v.) in Palestine and in Egypt, Antonius distinguished himself by his courage and activity and ingratiated himself with the soldiers. After assisting Cæsar in Gaul, he went to Rome, in 50 B.C., to advance the interests of the former, who stood in great danger from the hostility of the oligarchical party, and was appointed an augur and chosen one of the tribunes of the people. In the following year, on account of his adherence to the party of Cæsar, he was expelled from the curia and fled to Cæsar, who made use of this event as a pretext for his war against Pompey. At the outbreak of this war Antonius received the appointment of commander-in-chief in Italy. In the battle of Pharsalus he commanded the left wing of Cæsar's army. In 47 he was made master of the horse by Cæsar, who left him to govern Italy during his absence in Africa. Antony, as usual, disgraced himself; was perpetually drunk; divorced his wife and married an actress, with whom he paraded himself offensively through the chief towns of the peninsula. In 44 B.C. he married Fulvia, the widow of Clodius, was made consul, and vainly endeavored to prevail on the Romans to recognize Cæsar as Emperor. After the assassination of Cæsar he played the part so well described by Shakespeare, and by his funeral oration and the well-timed display of Cæsar's bloody robe so wrought upon the passions of the people that the conspirators were compelled to escape from Rome, leaving the successful orator for a while in possession of almost absolute power. A formidable rival to Antonius now appeared in the person of the young Octavianus (the future Augustus), whom Cæsar had designated as his heir, and a contest for the ascendancy ensued. The eloquence of Cicero, who, in his *Orationes Philippicæ*, denounced Antonius as an enemy of the State, secured the triumph of Octavianus in the Senate. Antonius, who had been besieging Decimus Brutus in Mutina (Modena), in order to obtain possession of Cisalpine Gaul, which had been voted to him by the people as one of his provinces (Brutus claimed it because after Cæsar's death the Senate had assigned it to him, as part of its agreement with the Liberators, as the murderers of Cæsar called themselves) was finally overthrown by the forces of the Senate in 43 B.C. He escaped beyond the Alps, visited the camp of Lepidus, who commanded in Spain and Gaul against the Pompeians, and gained the favor of his army, of which he took command. Plancus and Pollio joined him with their troops, and Antonius, who so recently had escaped as a helpless fugitive from Italy, returned toward Rome at the head

of 17 legions and 10,000 cavalry. Octavianus, who had pretended to maintain republican principles, was ordered to oppose Antonius; refusing to do this, he now threw off the mask and held a consultation with Antonius and Lepidus near Bologna, at which it was determined that as triumvirs they should share the whole Roman world among themselves. To secure their spoil, they returned to Rome and began their course of murder and robbery throughout Italy. Among their first victims fell Cicero, the orator, whose eloquence they dreaded. According to Appian (see APPIANUS), 300 senators and 2000 knights were put to death in the proscriptions of the triumvirs.

After making Italy safe for themselves and raising an enormous sum of money to carry on their war abroad, Antonius and Octavianus led their troops into Macedonia against Brutus and Cassius, and defeated the republican forces at Philippi (42 B.C.). Antonius next paid a visit to Athens, and then went into Asia, to subdue the East and to punish Cleopatra, Queen of Egypt, whose conduct had offended the triumvirs. The Queen herself appeared to answer his challenge and captivated Antonius by her beauty and address. The general who had overcome Brutus and Cassius was now made a prisoner, though not of war. He followed Cleopatra into Egypt and lived with her in idleness and luxury, until he was aroused by tidings of the quarrel which had taken place in Italy between his own relatives and Octavianus. This dispute gave rise to a short war, which came to an end before Antonius arrived in Italy. A new division of the Roman world between the triumvirs was soon quietly arranged at Brundisium, 40 B.C.; Antonius took the East, from the Adriatic to the Euphrates, Octavianus took the West; the ambition of the feeble Lepidus was appeased by his having the whole of Africa for his portion. Even this shadow of dominion was taken from him in 36 B.C. Meanwhile Antonius had confirmed his renewal of friendly relations with Octavianus by a marriage with Octavia, his sister. He now returned to Cleopatra, resumed his former voluptuous mode of life, squandered the wealth of Rome in gifts to his royal mistress, and became guilty of gross acts of injustice. Octavianus made use of these facts to excite the indignation of the Roman people against Antonius, and a war between the rivals became unavoidable. Antonius, in his idleness, tried to postpone the trial of strength which he saw inevitably approaching. In 36 B.C. he met disaster in an expedition against the Parthians; this increased popular disquiet at his conduct with Cleopatra. Presently, at Rome, he was formally deprived of his power, and war became inevitable. This Octavianus skillfully caused to be proclaimed against Cleopatra, thus putting himself into the position of one defending his country against a foreign foe, and Antonius into that of one supporting a foreigner against his fatherland. In the naval engagement which took place (31 B.C.) near Actium (q.v.), Antonius and Cleopatra were utterly defeated. His subsequent hope of finding troops still faithful to him in Libya was disappointed. He returned to Egypt, where, with Cleopatra, he once more forgot political cares and vexations, until his amusements were suddenly interrupted by the arrival of Octavianus at Alexandria. Antonius now roused himself, made a charge with his cavalry, and repelled the enemy; but the ad-

vantage was only momentary. Deserted by the Egyptian fleet, as by his own army, and suspecting that even Cleopatra had conspired against him, he went to her palace, from which the Queen had escaped. Deceived by a false message informing him of the death of Cleopatra, Antonius committed suicide by falling upon his sword, in the year 30 B.C. He died in the arms of Cleopatra, who immediately after put an end to her life.

ANTONIUS, SAINT. See ANTONY OF PADUA.

ANTONOMASIA, ăn'tō-nō-mă'zhī-ă (Gk. ἀντονομασία, from ἀντί, *anti*, against + ὀνομάζειν, *onomazein*, to name). In rhetoric, the substitution of any epithet or phrase for a proper name; as "The Stagyrte" for Aristotle, "The Little Corporal" for Napoleon, "The Man on Horseback" for Grant, "The Man from Nowhere" for Kipling, etc. Sometimes the process is reversed; as, calling a good orator a "Cicero." In either case the figure is akin to metonymy.

ANTON ULRIC, ăn'tōn ũl'rik (1714-80). The second son of Duke Ferdinand Albert of Brunswick-Wolfenbüttel (till 1735 Brunswick-Bevern, the title by which the Prince was first known in Russia). He married Anna Karlovna (q.v.), niece of Anna Ivanovna, Empress of Russia, in 1739. In 1740 the Empress fell dangerously ill and appointed Ivan, the infant son of Anton, her successor, with Biron as regent. After her death Anton Ulric made some feeble attempts to reverse these appointments, which only led to the punishment of those supposed to have instigated them and to his own military degradation. Biron's conduct toward the parents of the infant Prince became unbearably insolent, and Anna appealed in despair to General Münnich, who put a sudden end to Biron's sway and declared the Grand Duchess and her husband regents. After a few months Anna ungratefully overthrew Münnich. After his fall, as little unity prevailed among the ministers as between herself and her husband, and the government was looked upon as both a foreign and a contemptible one. Then came the revolution of Dec. 5, 1741, which raised Elizabeth Petrovna (q.v.) to the throne. Anton Ulric and his consort were exiled, and lived long at Kholmogory, in the government of Archangel. Anna died in 1746. Catharine II offered Ulric his freedom, but he declined it. Ultimately he grew blind. Catharine gave his children comfortable homes in Jutland. Consult Brückner, *Die Familie Braunschweig in Russland* (St. Petersburg, 1876).

AN'TONY, SAINT, OF THEBES (c.251-356). The father of monastic asceticism, known as the Great. He was born at Koma, near Heraklea, in Upper Egypt. His parents were both wealthy and pious, and bestowed on him a religious education. Having, in obedience to what he believed to be a divine injunction, sold his possessions and distributed the proceeds among the poor, he withdrew into the wilderness, where he disciplined himself in all those austerities which have hallowed his memory in the Catholic church and formed the model of the monastic life. When 30 years of age, however, desirous of obtaining a deeper repose than his situation afforded, he penetrated farther into the desert and took up his abode in an old ruin on the top of a hill, where he spent 20 years in the most rigorous seclusion; but in 305 he was persuaded to leave this retreat by the prayers of numerous anchorites who wished to live under

his direction. He now founded the monastery of Fayum, which was at first only a group of separate and scattered cells, but which, nevertheless, may be considered the origin of cenobite life. He declined, however, to preside over a monastery. The persecution of the Christians by Maximian, in 311 A.D., induced St. Antony to leave his cell and proceed to Alexandria to comfort the martyrs; but in the course of a year he returned to his solitude, which he soon left and plunged yet deeper into the desert. At length he found a lodgment on a hill, about a day's journey from the Red Sea; but his disciples, discovering his retreat, so pressed him with their affectionate importunities that he ventured to accompany them back. After many pious exhortations he once more left them and soon became the mighty oracle of the whole valley of the Nile. In 335 the venerable hermit made a journey to Alexandria, at the request of Athanasius, to dispute with the Arians. He had interviews with Athanasius and other distinguished persons, but soon retired to his desert home, where he died, 356 A.D.

His whole conduct indicates the predominance of a glowing and yet gloomy fancy, and a disposition to lead a life of absolute solitude. Although the father of monachism, St. Antony is not the author of any monastic "rules"; those which the monks of the Eastern schismatic sects attribute to him are the production of St. Basil. He is, perhaps, the most popular saint in the Catholic church. The chief source of information is the *Life of St. Antony*, attributed to Athanasius. Accounts of his life and miracles are given in the *Acta Sanctorum* of the Bollandists, under the date of the 17th of January, on which day his festival was kept.

ANTONY, SAINT, OF PADUA (1195–1231). A famous saint. He was born at Lisbon, Portugal, Aug. 15, 1195, baptized as Ferdinand, but took the name Antony when he entered the order of St. Francis, in 1220, after being a canon of St. Vincent's in Lisbon, and already noted for biblical and patristic learning. In 1221 he attended a meeting of the order at Assisi and made a poor impression, but soon after produced great astonishment and delight at a meeting with the Dominicans, and was sent by St. Francis as revival preacher to northern Italy, where he met with tremendous success. In 1223, after studying at St. Francis's direction mystical theology for five months, he was appointed the first theological tutor in the order, and taught in northern Italy and France. In 1227 he became provincial of northern Italy; in November of that year he entered Padua for the first time. In 1230 he went to Rome as delegate to get the papal decision upon the binding nature of certain points in the Franciscan rule—not, as frequently asserted, to secure the deposition of the general of the order. He died at Padua, June 13, 1231. He was canonized by Pope Gregory IX in 1232. His great repute as a preacher gave rise to legends of miraculous powers. He is the patron saint of animals. Once he preached a sermon to the fishes, it is said, and they listened to him with rapt attention. Joseph Addison gave an abstract of it in his *Remarks on Italy*. For the classic biography of Antony, consult Emmanuel de Azevedo of Coimbra, *Vita del Taumaturgo . . . Sant' Antonio di Padova* (latest ed., Padua, 1829). Consult also: De Chérance, *Antony of Padua* (London, 1895); I. Beale (1897), Mrs. Arthur Bell (1901), in

French by A. Lepître (Paris, 1901). His works were published by Horoy in his *Medii Ævi Bibliotheca Patristica* (Paris, 1885).

ANTONY AND CLE'OPA'TRA. A tragedy by Shakespeare (1607). It was based upon the life of Antony in North's *Plutarch* and is admired for the vigor with which the author deals with a difficult theme. The play is to some extent imitated in both Dryden's *All For Love* and Fletcher and Massinger's *The False One*.

ANT PLANTS. See MYRMECOPHYTES.

ANTRAIQUES, än'trâg', EMANUEL LOUIS HENRI DE LAUNAY, COMTE D' (1755–1812). A French publicist and diplomat. He was born at Villeneuve, department of Ardèche. His talents were first displayed in his *Mémoires sur les Etats-généraux, leurs droits et la manière de les convoquer* (1788), in which he predicted the downfall of absolute monarchy realized in the French Revolution. In 1789, when he was chosen a deputy, he defended, however, the privileges of the hereditary aristocracy. In 1790 he was employed in a diplomatic mission at St. Petersburg and Vienna, where he upheld the cause of the Bourbons. He incurred the displeasure of Bonaparte, but fled from France in 1798. In 1803 Alexander of Russia sent him on an embassy to Dresden, where he wrote a brochure against Napoleon, entitled *Fragment du XVIII livre de Polybe trouvé sur le mont Athos*. He was murdered, with his wife, near London by an Italian servant. Consult L. Pingaud, *Un agent secret sous la révolution et l'empire le comte d'Antraiges* (Paris, 1893).

AN'TRIM. A maritime county in the north-east of Ireland, in the province of Ulster. It is bounded, north, by the Atlantic; west, by the north part of the river Bann, dividing it from Londonderry, and by Lough Neagh; south, by Lagan River, separating it from the county of Down; southeast, by Belfast Lough; and north-east, by the North Channel (Map: Ireland, E 2). Its greatest length is 56 miles, its greatest breadth, 20 miles; its extent of seacoast, 90 miles. Area, 1176 square miles. About two-thirds of this is arable, and there are few forests. Mines of fine salt occur at Carrickfergus, and small coal fields near Ballycastle and in the interior. Rich beds of a fine quality of iron ore are worked at Glenravel, and this is exported from Cushendall and Carnlough. The soil of Antrim is light, and the chief crop is oats. The land is much subdivided, and the raising of flax, and various branches of linen, cotton, and coarse woolen manufacture employ a great portion of the people, although grazing is becoming more and more important. There are salmon and other fisheries, which furnish employment for the inhabitants along the coast. The principal towns are Lisburn, Ballymena, Ballymoney, Carrickfergus, Larne, and Antrim. In 1898 Belfast, the former capital, was constituted into a county borough. Pop., 1911, 478,603. In 1891 the population embraced in the present county limits was 208,010, 196,090 in 1901, and 193,864 in 1911. This county is not seriously affected by emigration.

AN-TUNG, än'töong'. A town in south-eastern Manchuria, on the Yalu, about 7 miles from its entrance into the Bay of Korea (Map: Korea, F 4). In 1911 its population was estimated to be over 160,000. It is the seat of a United States consul. It was the headquarters of General Kuroki during the battle of the Yalu in the Russo-Japanese War.

ANTWERP (Fr. *Anvers*). A province of Belgium south of the Netherlands, with an area of 1093 square miles (Map: Belgium, C 3). The soil, in some places reclaimed heaths, is fertile and yields grain and vegetables. Cattle and other domestic animals are raised. The chief manufactures of the province are laces, sugar, wool, cotton fabrics, and liquors. Capital, Antwerp. Pop., 1900, 819,159; 1910, 968,677; 1911 (est.), 987,201.

ANTWERP (Fr. *Anvers*, anciently *Andoverpum*, from *Anc de Werp*, at the wharf, harbor). A city of Belgium, capital of the province of the same name, situated on the right bank of the Scheldt, in lat. 50° 13' N., long. 4° 23' E. (Map: Belgium, C 3). It ranks first in commercial importance and second in population among the cities of Belgium, and its harbor is considered one of the best in Europe. Antwerp is situated in a fruitful and well-cultivated region. The larger part of the city lies within the walls, which have been continually extended and improved and at present have a total length of 8 miles. In point of architectural beauty and artistic achievements, Antwerp has but few rivals among European cities.

The most noteworthy edifice is the cathedral of Notre Dame, the noblest and largest specimen of Gothic architecture in the Low Countries. It is 383 feet long, 213 feet wide, 131 feet high, and covers an area of 70,060 square feet. It was begun in 1352 and continued at various periods during the fifteenth and sixteenth centuries. The roof is supported by 125 pillars, and the tower (403 feet high), whose exquisite beauty Charles V was wont to compare to Mechlin lace, is a marvel of gracefulness. The highly ornamented portal and the fine tracery of the window above it are particularly worth seeing. The impressive interior, the unusual seven-aisled division of which is to be noted, contains three celebrated works by Rubens, "The Descent from the Cross," "The Elevation of the Cross," and, adorning the high altar in the choir, "The Assumption"; the first named being the most magnificent, and generally considered his masterpiece. The church of St. James, begun in the late Gothic style, in 1491, and completed in 1656, outranks the cathedral in the splendor of its decorations and monuments. It has many altars, private chapels, and burial vaults, belonging to the most distinguished families of Antwerp, and contains the tomb of Rubens, who devoted himself to its embellishment. Of the secular buildings, the Hôtel de Ville, in the Grande Place, a fine structure in the Renaissance style, dating from 1561 to 1565, and rising to a height of 180 feet, and the Bourse, a stately edifice in the late Gothic style, deserve especial attention. The museum, erected in 1879-90, from plans by Winders and Van Dyck, is an imposing rectangular structure, inclosing six inner courts. Its picture gallery boasts of an unusually fine collection of paintings by the old masters, including about 800 canvases, especially of the Flemish school, among which are rare specimens by Jan van Eyck, Memling, Massys, Rubens, Van Dyck, etc.; "The Entombment of Christ," the masterpiece of Quinten Massys, and the "Christ Crucified," by Rubens, a work of great dramatic effect, being the most remarkable. Worthy of mention are also the Musée Plantin-Moretus, famous for its collection of everything pertaining to the early history of printing, the Guild Hall of the Archers, the

Vielle Boucherie, or old meat market, and the Steen, part of the old castle dating from the tenth century, once the seat of the Inquisition and now containing an archaeological museum.

Antwerp is administered by a burgomaster, assisted by five assessors and a municipal council. The burgomaster is nominated by the king for a period of eight years. The assessors are chosen by the municipal council for the same period. The municipal council numbers 39 members, including 8 members from the labor council, who are elected by all voting citizens for 8 years. The city is divided into 9 districts, administered by commissioners. Water is supplied by private companies. With the exception of the railway stations and the harbor, which have electric lights, the city is lighted by gas. The municipal expenditure in 1910 was 49,440,011 francs.

The most noteworthy educational institutions are the commercial school, established in 1852, the Athénée Royal, the Royal Museum of Fine Arts, dating from 1665, and attended by over 160 students, and the Royal Conservatory of Music, with an attendance of about 1350. Some of the higher schools are managed by Jesuits, and the German School is supported by the German government. Besides numerous scientific associations, Antwerp has many societies for the advancement of art, and its triennial exhibition of paintings is regarded as an important event in the world of art. The city has 2 theatres and 2 municipal libraries. Of the 16 daily newspapers published in Antwerp 6 are in French and 10 in Flemish. Besides 2 hospitals with 900 beds, an insane asylum, and asylums for orphans and aged people, there is a considerable number of minor charitable institutions maintained by private societies. The industrial establishments of Antwerp include distilleries and breweries, textile mills, diamond-cutting works, sugar refineries, cigar factories, etc. Antwerp is inferior to few European cities in the volume of its commerce; it is one of the greatest centres of the grain import trade. Its commerce is chiefly with the Balkan countries, Russia, the United States, and South America. The total annual value of the commerce, of which a large portion is transit, exceeds \$1,200,000,000. Antwerp has magnificent harbor advantages. The quays, built of granite, have a total length of 3½ miles and are provided with gigantic cranes for the loading and unloading of vessels. There are 8 large basins and a number of smaller ones connected by sluices with the Scheldt. Plans for enlarging the port were decided upon in 1905. Its area was to be tripled, giving it 37.3 miles of running quays, a canal was to be constructed 5 miles long and 815 feet wide, and also an artificial channel for the Scheldt, the sand banks of which are rather dangerous to navigation. The cost of the work was estimated at 250,000,000 francs (\$48,250,000), and the time necessary for its completion no less than 10 years. In 1911, 6908 vessels of 13,330,699 tons entered at the port, and 6928 of 13,325,781 tons cleared. Antwerp is the chief arsenal of Belgium and is fortified by strong ramparts and numerous citadels and forts, which the government contemplates to extend so as to include a circumference of nearly 80 miles. It has also devices for the flooding of the surrounding country and contains a garrison of about 10,000 men. In 1800 the population was about 40,000; in 1830, 73,500; in 1880, 169,112; in 1900,

272,831; in 1910 (census of December 31), 301,766. With the communes of Berchem, Borgerhout, and Hoboken, which are practically part of the city, the 1910 population was 398,255. The average annual temperature of the city is about 50°, or nearly the same as that of New York.

Antwerp appears in history as early as the seventh century, is spoken of as a market town some hundred years later, and by the middle of the twelfth century seems to have attained considerable prosperity as a trading town. Steadily extending its commercial operations under the rule of the Dukes of Burgundy, it became in the second half of the fifteenth century the world-mart of Europe, supplanting the other great Flemish cities, Bruges and Ghent. It was the *entrepôt* for the trade between England and the Continent, and in its harbor vessels from the north and the south of Europe met to exchange their cargoes. In the first half of the sixteenth century, under the rule of Charles V, the city was at the height of its splendor and prosperity. It was the principal station of the Hanseatic League and the centre of the money exchanges of Europe, while its manufacturing industry was on a level with its vast shipping. Material prosperity was accompanied by intellectual progress, and the great schools of Flemish painters made Antwerp their principal home. The events of the Reformation brought about a sudden decline. The reign of terror instituted by the Duke of Alva; the massacre of 6000 citizens, and the burning of 800 houses during three days in 1576 ("the Spanish Fury"); and the siege of 14 months by the Duke of Parma (1584-85), to whom the city offered a heroic but ineffectual resistance, sapped the prosperity of Antwerp. Its population at the end of the sixteenth century had dwindled to 55,000, or less than half of what it had been at the beginning of the century. Its ruin was completed by the Peace of Westphalia (1648), which closed the navigation of the Scheldt. This impediment continued until 1863, except during the French occupation (1794-1814) and during the period when the city belonged to the kingdom of the Netherlands (1815-30). By 1800 the population had declined to less than 40,000. Napoleon then attempted to set it up as a rival port to London. During the Belgian Revolution of 1830 the Dutch general Chassé held the citadel for two years against the citizens, until he was forced to surrender by a French army under Gérard. After the revolution the growth of the city was rapid. Consult: J. P. Van Mol, *Guide to Antwerp* (Antwerp, 1886); E. Rowland, "Le Port d'Anvers," in *L'Economiste Français*, vol. ii (Paris, 1899); "The Great Fire at Antwerp, and its Effects," in *The Builder*, vol. lxxx (London, 1901).

ANTYL'LUS (Gk. Ἄντυλλος, *Antyllos*). A Greek physician and surgeon who is supposed to have lived in the third or fourth century A.D. He is said to have been a voluminous writer, but only the fragments of his works quoted by Oribasius are extant. Of these extracts, the most interesting describe his method of operating on aneurisms. This method is still used and known by his name. (See ANEURISM.) Antyllus is the earliest writer whose directions for performing tracheotomy are extant.

ANU, ä'nōō. The chief god of the Babylonian pantheon, the king and father of the gods. He seems to have been originally a Sumerian deity

representing heaven (ana), and the Akkadians also conceived of him as seated at the north pole of the ecliptic. He was "the great god" of Der (Dur-ilu, southeast of Bagdad) and had a temple at Uruk (see ERECH) which he shared with his daughter Nanai (Ishtar), as well as one at Assur (q.v.) which he shared with Adad (q.v.). A recently discovered Sumerian inscription, giving an account of the deluge, shows that Anu originally was the local god of a city bearing his name. The city has not been identified. With Ellil (of Nippur) and Enki or Ea (of Eridu) he forms a triad frequently invoked. But, like other heaven gods, he is not prominent in the cult and has more relations with the gods who flee to him for refuge than with men. As the functions of the old god Anshar (Ashur) had been transferred to Anu, so the citizens of Babylon regarded Anu as having transferred the rule of the world to their local god Marduk. Consult Jensen, *Die Kosmologie der Babylonier*, pp. 18, 272 (1890); Zimmern, *Die Keilinschriften und das Alte Testament: Religion und Sprache* (1902); Jastrow, *Die Religion Babyloniens und Assyriens* (1902-12); Jeremias, *Das alte Testament im Lichte des Alten Orients*, p. 94 (1906).

ANU'BIS (Gk. Ἄνουβις, *Anoubis*, hieroglyphic *Anúpu*). An Egyptian deity. His original seat of worship is not known with certainty, but there is some reason to believe that it was near Memphis. As his sacred animal, the jackal, haunts the desert valleys used as burial places, Anubis became the god of the necropolis and was supposed to conduct the souls of the dead down to the lower world, Amenthes, like the Greek Hermes Psychopompos. Hence the late Greek combination Hermanubis. Anubis was also the assistant of Osiris at the final judgment, and weighed in the scales the heart of the deceased against the feather, symbolic of truth and right. As the balance was found level or the reverse, the fate of the deceased was determined. When a more elaborate mythological system was formed, Anubis was made the son of Osiris by his sister Nephthys. The god is usually represented in human form, with the head of a jackal, which the Greeks changed into that of a dog and called the cities sacred to Anubis, Kynopolis ('Dog City'). Of these cities, the best known is that in Middle Egypt. In Roman times, when the Egyptian worship had spread to Italy, Hermes, who was identified with Anubis, sometimes had the dog's head among his insignia. For illustration, see EGYPT. See BABOON.

ANU'KIS (Egyptian *A nūqet*). An Egyptian goddess worshiped in the district around the first cataract of the Nile. She usually accompanies the god Chnum and is represented in human form, with a red crown of feathers on her head. For some reason now unknown she was identified by the Greeks with Hestia (Lat. Vesta). For illustration, see EGYPT.

ANU'RA (Gk. ἄν, *an*, priv. + οὐρά, *oura*, tail), of SALIENTIA (Lat. from *salire*, to hop, jump). An order of Amphibia embracing about 900 forms, including those that have no tail when adult. It is subdivided by Cope into three sub-orders: Aglossa, African and tropical American (Pipa) toads, and fossil forms; Firmisternia, frogs; Arcifera, toads. The two latter are now included in the sub-order Phaneroglossa.

ANURADHAPURA, ä-nōō'räd-ha-pōō'rä. A

ruined city in the northern part of Ceylon, 50 miles from Dambul. In ancient times it was the capital of the island and achieved considerable importance. In the last decade of the nineteenth century the surrounding jungle was thoroughly explored, and many new ruins were disclosed. Most of these have been set apart for conservation by the crown. The population in 1911 numbered about 3700.

A'NUS (Lat.). The external termination of the rectum. The anus is kept firmly closed by the *external* and *internal sphincter* muscles, the former of which contracts the integument around the opening and, by its attachment to the coccyx behind and to a tendinous centre in front, helps the *levator ani* muscle in supporting the aperture during the expulsive efforts that are made in the passage of the fæces or intestinal evacuations; while the latter, or *internal sphincter*, is an aggregation of the circular muscular fibres of the lowest part of the rectum and acts in contracting the extremity of the tube. The main function of the *levator ani* muscle is expressed in its name. It supports the rectum and pelvic structures and during the act of defecation lifts the lower end of the gut up from the mass of extruded fæces. The integument around the anus lies in radiating folds, which allow of its stretching without pain during the passage of the fæces; and the margin is provided with a number of sebaceous glands, which, in some of the lower animals, secrete strongly odorous matters. (See SCENT GLANDS.) Infants are occasionally born with an imperforate anus, or congenital closure of the rectum. In the simplest form of this affection the anus is merely closed by thin skin, which soon becomes distended with the meconium (q.v.). More complicated cases are those (1) in which the gut terminates some distance above the seat of the anus in a blind sac or pouch, (2) where the rectum terminates in the bladder, urethra, or vagina. Fortunately the closure by a layer of skin is far the most common form of imperforate anus, and the condition is readily relieved by a simple surgical operation. The complicated cases require opening of the abdominal cavity and creating an artificial anus in the lower part of the abdominal wall. If the condition of imperforate anus is neglected, the child dies in a few days as a result of intestinal obstruction.

Spasm of the sphincter ani is characterized by violent pain, with difficulty in passing fæces. On examination, the muscle feels hard, and resists the introduction of the finger. Spasm of the sphincter is a symptom of fissure, ulcer, or some other form of anal or rectal irritation. Suppositories containing opium or belladonna, introduced during the period of relaxation, are sometimes of use, and if there are ulcers or fissures they must be speedily treated. *Ulceration* around the anus, not extending within the orifice, is common in persons who are not cleanly, especially in women with vaginal discharges. The treatment consists in strict attention to cleanliness, and application of silver nitrate or carbolic acid. If the ulcer is seated partly *without* the anus and partly *within* the rectum, the distress is much more severe. *Fissure of the anus* is an affection consisting in one or more cracks, excoriations, or superficial ulcerations, situated between the folds of the skin and mucous membrane at the verge of the anus and only slightly involving the rectum. They give

rise to intense pain during the passage of the evacuations, and for some hours afterward to great discomfort, smarting, and itching. The treatment to be adopted is to endeavor to procure regular and somewhat soft evacuations, and to sponge with warm water immediately afterward, the parts being dried with a soft cloth. One or two applications of solid nitrate of silver will sometimes cure the disease, and an ointment of oxide of zinc, or one containing cocaine, will serve to allay irritation and promote healing. If these measures do not afford relief, the sphincter muscle must be dilated, the base of the fissure incised and curetted. *Pruritus ani*, which simply means itching and irritation of this part, is a symptom of certain morbid changes rather than a special disorder; but it is a very common affection, and is productive of much suffering. It is often associated with an unhealthy state of the intestinal secretions or with simple constipation; with uterine and ovarian diseases; kidney disease; diabetes; neurasthenia; tea, alcohol, tobacco, and opium habits; the presence of threadworms in the rectum; eczema, or other skin diseases; and it is peculiarly common in persons whose occupations are sedentary. The affection is often aggravated by the patient's being unable to refrain from scratching, which tends to create excoriations, ulcerations, and thickening of the skin. The treatment must aim to remove the cause, whether general or local. If the affection arise from worms, or a loaded state of the large intestine, enemata and purgatives will give immediate relief. If unhealthy excretions exist, attention must be paid to the diet, the bowels must be kept freely open, and strict local cleanliness observed. If there are any cracks or ulcers, these must be treated. In all cases of pruritus which have persisted for any length of time, the skin is found thickened and the redundant layers of epidermis must be removed and kept from re-accumulating by the application of suitable ointments. The other principal affections of the anus are *fistula*, *piles*, and *prolapsus*, which are discussed in special articles.

AN'VARI. A Persian poet famed for his panegyrics and for his verse in satiric vein. His full name was Auad-uddin Ali Anvari. He was born in the first part of the twelfth century, in the province of Khorassan. He first wrote under the title of Khavaran, from his native district; but he afterward adopted Anvari as his poetic epithet, and by this he is known to fame. He was educated at the collegiate institute at Tus (see FIRDAUSI), and he devoted his attention especially to astronomy; but finding more opportunity for preferment at court in literature, he composed a panegyric in honor of Sanjar, the ruler of Khorassan. This by its artistic grace immediately won him the royal favor, and he continued to enjoy the patronage of Sanjar's two successors as well. But Anvari's latter days were attended by ill luck. Employing his astronomical knowledge, he prophesied that a certain conjunction of the stars in October, 1185, would be accompanied by a frightful storm and dire disasters. The utter failure of the evil portents which were predicted drove him practically into banishment, and he withdrew to Nishapur and later retired to Balkh, where he died about 1190. Anvari's verses, as shown by his *Divan*, or poetical collection, are masterpieces of artistic form. With the consummate skill of a romantic panegyrist he combined, in high degree, the

subtle force of a keen satirist of the foibles and follies of his time. His elegy on the captivity of Sanjan has been pronounced one of the most beautiful in Persian literature. There is a lithographed edition of the *Divan* (Lucknow, 1880). Consult Ethé, in the *Grundriss der iranischen Philologie*, vol. ii (Strassburg, 1896-1904). See PERSIAN LITERATURE.

AN'VIL (ME. *anvelt*, AS. *anfilte*, of uncertain origin). An iron or steel block, with a smooth, flat face or top, on which malleable metals are hammered and shaped. Anvils vary in size from the tiny articles used by jewelers to the enormous anvil blocks of power hammers, which weigh several tons. (See HAMMERS.) Blacksmiths' anvils have a cone or horn at one end of the flat face and a socket for a chisel in the other end. They are commonly made of cast iron faced with steel, the steel face being placed at the bottom of the mold and the iron poured upon it.

ANVILLE, ä'n'vêl', JEAN BAPTISTE BOURGUIGNON D' (1697-1782). A French geographer. He was born at Paris and devoted himself to geographical and mathematical studies with such success that at the age of 22 he became royal geographer. He read the Greek and Latin historians and philosophers, as well as poets, noting the names and positions of cities and nations. He advanced the science of geography, not only by the number of maps (211) which he published, but also by publication of 78 memoirs full of erudition and of historic and critical details. Most of these are included in the *Recueil des mémoires de l'Académie des Inscriptions et Belles-lettres*. His great map of Africa was the most complete yet published. Among the most important of his works are *Atlas général* (1737-80) and *Atlas Antiquus Major*, with the *Géographie ancienne abrégé* (3 vols., 1769). His *Compendium of Ancient Geography* was published in English in London (1791) and in New York (1814). Consult O. Hartig, *Aeltere Entdeckungsgeschichte und Kartographie Afrikas mit Bourguignon d'Anville als Schlusspunkt* (Vienna, 1905).

ANZAN, än-zän', or **ANSHAN**, än'shän'. The name of an important city and also a country in the Zagros Mountains. Gudea of Lagash declares that he captured the city of Anshan. In the Nabunaid-Cyrus Chronicle Cyrus calls himself "king of the city of Anshan," and in the Cylinder Inscription he gives the same title to his father Cambyses, his grandfather Cyrus, and his great-grandfather Teispes. On the other hand, Anshan is mentioned with Elam, Simash, and Barachsu as a country in the inscription of Anumutabil of Der; and the booty of Ecbatana is said to have been carried by Cyrus to the land of Anshan. The priestly rulers in Susa under Babylonian suzerainty call themselves patesis of Susa and governors of Elam and Simash, but do not mention Anshan, or Anzan. Later, however, the independent kings in Elam in the twelfth century give themselves uniformly the title "king of Anzan and Susa." Eduard Meyer identifies Anzan with Susa, and much may be said in favor of this view. The objection based on the juxtaposition of Anzan and Susa may perhaps be met by the not improbable assumption that there were two cities, possibly on either side of the Choaspes—one where the native element continued to dominate, called Anzan, and the other where the Semitic influence since the

Akkadian conquest was more strongly felt, which was called Shushun-Susa. This would explain why Susa alone is mentioned by the patesis, and also by Asurbanipal; while the native kings put Anzan first, and the dynasty of Teispes used Anshan alone. It was in Anzan-Susa that the ancestors of Cyrus reigned for three generations, and the great conqueror himself from 559 to 550 B.C., when the capture of Ecbatana made him King of Media and Persia. Consult: Billerbeck, *Susa* (1893); Scheil, *Textes élamites-anzanites*, i, ii, iii (1901-07); Ed. Meyer, *Geschichte des Altertums*, i, 2, pp. 409 f. (1909). See SUSA; CYRUS.

ANZENGRUBER, än'tsen-grōō'bēr, LUDWIG (1839-89). An Austrian dramatist and novelist, born at Vienna. He left school early, and after spending some time as bookseller's assistant, became a strolling actor at the age of 20. While leading this life (1860-67), he wrote a number of plays, none of which met with success, then returned to Vienna to try his hand at literature, and finally accepted a clerical position in the police department of his native city. While thus employed he produced, in 1870, his *Pfarrer von Kirchfeld*, an anti-clerical drama, which caused a sensation and made him famous. He now decided to devote himself exclusively to literature. In the following year was performed the *Meineidbauer*, a powerful tragedy of peasant-life, by many considered his masterpiece. Even more popular proved his comedy *Kreuzelschreiber* (1872). All these plays were performed in the popular Theater an der Wien. In his dramas of modern Viennese life Anzengruber was less successful, but when he returned to the scenes and characters of the peasant life he knew so well, he achieved uniform success, as with his *G'wissenswurm* (1874) and many other plays. He showed the same power of character-drawing in his novels *Der Sehandfleck* (1876) and *Der Sternsteinhof* (1883-84). His pathos and humor are equally genuine. Although many of the characters in his plays and novels speak the dialect of Upper Austria and Styria, his works have won a conspicuous place in German literature, and several of his plays hold the German stage, at the present day. His *Gesammelten Werke* were published in 10 vols. (1890; 3d ed., 1897). Consult: A. Bettelheim, *Ludwig Anzengruber* (Dresden, 1891); R. Rosner, *Erinnerungen an Anzengruber* (Leipzig, 1891); S. Friedmann, *Ludwig Anzengruber* (Leipzig, 1902).

ANZIN, än'zän'. A town in the department of Nord, France, on the Scheldt, near Valenciennes, in the centre of a most productive coal-mining district (Map: France, N., J 2). Anzin has metal foundries, machine shops, glass-works, breweries, sugar refineries, and distilleries. Pop., 1901, 14,444; 1906, 14,387; 1911, 14,439.

ANZIO, än'zê-ō, formerly PORTO D' ANZIO. A Mediterranean seaport in the province of Rome, Italy, 33 miles southeast of Rome by rail (Map: Italy, G 6). It has fishing industries and, with Nettuno (pop., 1900), 1½ miles eastward, is a favorite bathing resort of the Romans. It occupies the site of Antium (q.v.). Excavations have brought to light remains of an ancient wall, but the modern town dates from the restoration of the harbor in 1698 by Pope Innocent XII. There are several palatial villas in the suburbs. Pop., 1901, 3561; 1911, 4506. Consult Sofredini, *Storia di Anzio* (Rome, 1879).

AOKI, ä'ō-kê, SHUZO (1844-1914). A Japanese statesman, born in Choshu. He was appointed

secretary of the Japanese legation at Berlin, in 1873, and afterward Minister there. He married the German Baroness von Rahden. In 1886-89 he was Vice-Minister of Foreign Affairs, in 1889-91, and in 1898-1900 Minister of Foreign Affairs. He became the first Japanese Ambassador to the United States in 1906, serving until December, 1907. Following his residence in Washington, he became a member of the Japanese Privy Council.

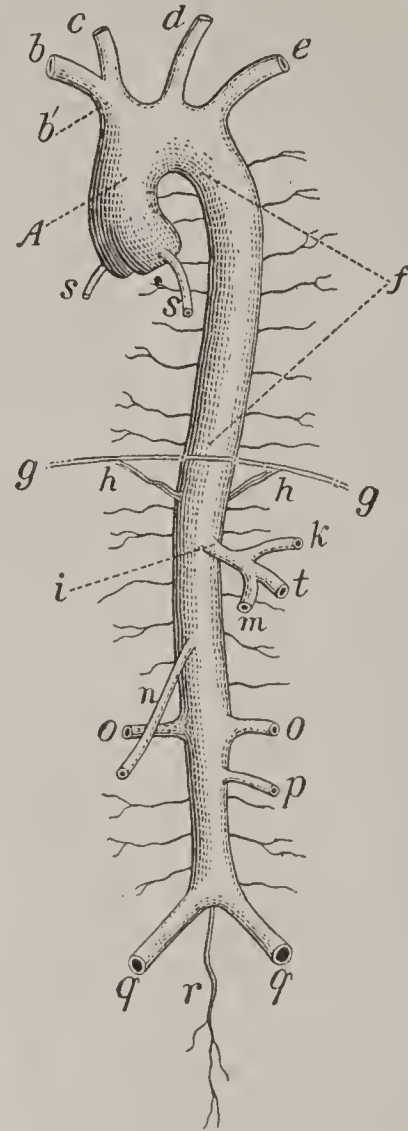
AOMORI, ä'ô-mô'rê, or **AWOMORI**, ä'wô-mô'rê. A seaport town of Japan, capital of the prefecture of the same name, situated at the northern end of Honshiu, on the Aomori Bay (Map: Japan, G 3). It is in the midst of the chief sphere of volcanic activity in the Empire. Pop., 1903, 34,857; 1908, 47,206.

AONIA, ä-ô'nî-â (Gk. 'Aovla). A district of Bœotia in ancient Greece. The Muses, as dwelling on Mount Helicon, in Aonia, were called *Aonides*.

A'ORIST (Gk. ἀόριστος, *aoristos*, without boundaries, undefined, unqualified, from *á*, *a*, priv. + *ὀρίζειν*, *horizein*, to divide, to bound). A form of the Greek verb which expresses the simple occurrence of an action in indefinite past time; it gets its name from the fact that it merely denotes "the occurrence of an action without any of the limitations as to *completion*, *continuance*, *repetition*, etc., which belong to other tenses." In distinction from the imperfect, the aorist expresses only the occurrence of an action or the entrance into a state or condition, while the imperfect represents an action or state as going on or as repeated in past time. Sometimes, too, in contrasts, the imperfect denotes attempted action, the aorist completed or successful action.

AOR'TA (Gk. ἀορτή, *aortē*, from *ἀείρειν*, *aeirein*, to lift, raise). The great arterial trunk which, rising from the left ventricle of the heart, sends its branches ramifying through the whole body. The aorta in man is subdivided by anatomists into the arch, the thoracic aorta, and the abdominal aorta. The *arch* is a loop with the convexity directed upward, forward, and to the right side, reaching at its highest part to a level with the second piece of the breastbone, and then descending to the left side of the fourth dorsal vertebra. Five arteries arise from the arch—viz., two coronaries, for the supply of the muscular tissue of the heart itself; the innominate, and the left carotid and left subclavian arteries. At the commencement of the arch are three small swellings or pouches, the aortic sinuses, below which are the three semilunar valves or folds of the lining membrane, which prevent regurgitation of the blood into the heart. The *thoracic aorta* extends from the fourth dorsal vertebra to the diaphragm, gradually occupying the mid line of the spine. The thoracic aorta gives off the bronchial arteries (two or three) to supply the tissue of the lungs; and some small branches (three or four) to the œsophagus, and intercostal arteries, to supply the walls of the chest (10 on left, and 9 on right side). The *abdominal aorta* extends from the diaphragm to the fourth lumbar vertebra, opposite the lower margin of which it divides into the two common iliac trunks. The abdominal aorta gives off the two phrenic arteries to the diaphragm; the cœliac axis, which divides into three large branches for the stomach, liver, and spleen; the superior mesenteric for the small, and part of the large intestine; the *renals* (two), one for each kidney; the *supra-renals* (two); the spermatic; the inferior mesenteric,

for the lower part of the large intestine; and four or five lumbar arteries, which supply the lower part of the abdominal walls (the loins). Where the aorta bifurcates, a small artery, the sacra media, or caudal artery, arises, and passes along in the mid line; in fish and in animals with large tails, this branch is a continuation of the aorta.



AORTA.

A, ascending arch of aorta; ss, coronary arteries; b', innominate artery; b, right subclavian; c, right carotid; d, left carotid; e, left subclavian; f, thoracic aorta; gg, diaphragm; hh, phrenic arteries; i, cœliac axis; k, coronary or gastric; t, splenic; m, hepatic; n, superior mesenteric; oo, renal arteries; p, spermatic; q, common iliac; r, middle sacral.

The above is the usual arrangement; but occasionally it varies, especially in the number of arteries springing from the arch. During fetal life there is a communication between the arch of the aorta and the pulmonary artery called the *ductus arteriosus*, the canal of which becomes obliterated after birth. The velocity of the blood current in the carotid artery has been estimated at 300 to 500 millimeters per second. For diseases to which the aorta is subject, see ARTERY; ARTERIOSCLEROSIS.

AOSTA, ä-ôs'tâ (anciently Lat. *Augusta*). A town in north Italy, on the left bank of the Dora Baltea, 49 miles northwest of Turin (Map: Italy, B 2), the site of the Roman Aosta, founded by Terentius Varro after he conquered the Salassi. There are many evidences of the Roman occupation still extant, their walls being especially well preserved. The Arch of Augustus, a cathedral said to have been founded by St. Eusebius, the Leper's Tower, celebrated in Xavier de Maistre's works, and the ruins of Bramafame Castle, belonging to the Counts of Challant, are all very noteworthy. The chief trade is in leather, cheese, and wine. The province is rich in iron, copper, and lead, in its pine forests, and in mineral springs, of which the most famous

are those of Courmayeur, Pré-Saint-Didier, and St. Vincent. Pop., 1881, 7437; 1901, 7875; 1911, 7008.

AOSTA, DUKE OF. A title of the House of Savoy, borne by Amadeus, a former King of Spain, and now by his son, Emmanuel Filibert.

AOUDAD, ä'oo-dād (Moorish name). The wild sheep of the mountains of northern Africa (*Ovis tragelaphus*), usually known as Barbary sheep. It is somewhat goatlike in form, 3 feet in height, and light brown in color, with very long whitish hair growing from the throat, chest, and about the forelegs. Its horns resemble those of the bharal, and do not exceed 24 inches in length. This animal is common in the high Atlas ranges, where it wanders over the more precipitous regions of their arid southern slopes from the Atlantic to Tunis, keeping within sight of the Desert, and hiding among the fantastically decomposed and bushy rocks of those limestone mountains with singular skill. The animal has many names. In menageries, where it breeds and lives well, it is often labeled "ruffed mouflon" or "bearded argali"; the Moors of Algeria call it "aoudad," but the natives there know it as "arūi"; it is the "kebsli" of the Egyptians, and the "tidal" or "teybel" or "beyden" of Nubia. (See Plate of WILD GOATS, ETC.) For habits and methods of chase, consult E. N. Buxton, *Proceedings Zoölogical Society of London* (1890) and id., *Short Talks* (London, 1898); Lydekker, *Wild Oxen, Sheep and Goats* (London, 1898).

APACHE, ä-pä'chā. A general name applied to several divisions of Athapasean-speaking tribes in New Mexico and Arizona. These are now designated as Jicarillas (northern New Mexico), Mescaleros (southern New Mexico), Chiricahua (Fort Sill, Okla.), White Mountain, and San Carlos (both in eastern Arizona). They formerly roved in small bands over an extensive territory in southeastern Arizona and southwestern New Mexico and extended their forays far down into Mexico. Although essentially predatory in habit and carrying on constant raids against the Mexican settlements, they remained on friendly terms with the Americans until provoked by outrages about the time of the annexation of their country by the United States, after which their condition was one of chronic hostility toward the citizens of both governments until they were finally subdued and confined to their present reservations. Upon the surrender of the last hostile band, the Chiricahuas, in 1886, such energetic protest against their continued presence in the Territory was made by the people of Arizona that the whole Chiricahua band was deported to the East and, after some years of military confinement in Florida and Alabama, was settled at Fort Sill, Okla., on the Kiowa Reservation, where the few survivors and their descendants are still held as military prisoners. In 1900 the Apache tribe, including 300 Chiricahuas at Fort Sill, numbered 5200 souls. The Lipans, although spoken of as Apaches on account of their linguistic affinity, are a distinct tribe, and hostile to the Apaches.

APACHE CAÑON. See GLORIETTA.

APACHE TIM'OTHY. See CANARY GRASS.

APAFI, ö'pö-fi, or **ABAFI**, ö'bö-fi, **MICHAEL I** (1632-90), Prince of Transylvania. He accompanied Prince George II in an expedition against the Poles in 1656, was taken prisoner by the Tatars, and after his release returned to his estate. In 1661 he was chosen Prince of Transylvania, through the support of Ali Pasha,

generalissimo of the Turkish forces under Sultan Mohammed IV. During the peace concluded with Austria after the battle of St. Gotthard (1664), he reigned peaceably under the protection of the Porte. He remained faithful to the Ottoman power till after the siege of Vienna in 1683. Fortune then changed. The Imperial troops invaded the country; and in August, 1687, Apafi made a treaty with the Emperor by which Transylvania was declared to be freed from Turkish suzerainty and placed under Austrian protection. At Fogaras the Transylvanian deputies, assembled at the National Diet, took the oath of fealty to the Hapsburgs as legitimate monarchs of Hungary. Ever since the death of his wife, Anna Bornemitz, in 1688, Apafi had been sorely afflicted both in body and mind, and died (April 15, 1690) on the eve of a fierce retributive war, commenced by his old allies, the Turks, who considered themselves ill-used by his desertion of them. His son, **MICHAEL II** (died 1713), succeeded to the throne and its perils. The Turks, under the vizier Kiuprili, overthrew the Imperial army, but the internal troubles of the Ottoman Empire hindered them, or rather Count Tökölyi (q.v.), whom they were supporting, from reaping the fruits of their successes. The Imperial troops subsequently regained everything. By the Treaty of Carlowitz, 1699, Transylvania was incorporated with Hungary, and the young Transylvanian prince was inveigled to Vienna and cajoled into giving up his dominions to Leopold I of Austria in lieu of a pension of some 15,000 florins.

APALACHEE, ä'pä-lä'chê, or **APALACHI**, ä'pä-lä'chī. A tribe of Muskogean stock formerly occupying the country about Apalachee Bay, northwestern Florida. About the close of the sixteenth century Spanish Franciscan priests established missions among them, which continued in a prosperous condition for more than 100 years, until invaded in 1702-08 by the English from Carolina, accompanied by a large force of Indian auxiliaries. In three several expeditions the mission churches were burned, the missionaries slain, and the Apalachee tribe practically wiped out of existence, more than 1000 prisoners being brought back to be sold as slaves in Carolina or distributed by the English among their savage allies. A large number were thus incorporated among the Creeks, where for a time they preserved their name and language, but are now extinct. Consult Gatchet, *A Migration Legend of the Creek Indians*, pp. 74-76 (Philadelphia, 1884).

AP'ALACH'EE BAY. An arm of the Gulf of Mexico near the northwestern part of Florida, extending about 50 miles inland (Map: Florida, D 1). It receives the waters of St. Mark's River, at the mouth of which stands the town of the same name. Its average depth is 18 feet, and it affords a good harbor for small craft.

APALACHICOLA, ä'pä-läch-ī-kō'lā. A city, port of entry, and the county-seat of Franklin Co., Fla., 85 miles southwest of Tallahassee, on St. George Sound (Gulf of Mexico) at the mouth of the Apalachicola River and the Apalachicola Northern Railroad (Map: Florida, C 2). The value of its foreign commerce amounted in 1912 to about \$700,000, consisting almost entirely in the export of lumber, other commodities, with imports, forming a very insignificant share. Pop., 1900, 3077; 1910, 3065.

APALACHICOLA. A river formed by the junction of the Chattahoochee with the Flint, at

the southwest corner of the State of Georgia. Thence flowing southward through Florida, it empties into Apalachicola Bay, an arm of the Gulf of Mexico. It is navigable for steamboats through its entire course of 90 miles.

APALIT, ä'pá-lét'. A town of Luzon, Philippines, in the province of Pampanga (Map: Luzon, E 7). It is situated 8 miles southeast of Bacolor, on the right bank of Rio Grande de la Pampanga, and had a population in 1903 of 12,206.

APAME'A ('Απάμεια). The name of several cities in western Asia. 1. A treasure city of the Seleucidæ (q.v.), in the valley of the Orontes, in Cœle-Syria. It was destroyed by Chosroes (q.v.), in the seventh century A.D., but was rebuilt. The Arabs called it Famia. It was still of consequence in the time of the crusades. 2. A city in Phrygia, founded by Antiochus Soter, near Celænæ, not far from the junction of the Marsyas and the Mæander. Here, in 188 B.C., was signed the treaty between the Romans and Antiochus the Great (q.v.). From Sulla's time it was an important centre of trade, thanks to its favorable position; many Italians and Jews resided there. From the third century A.D. it began to decline. Since the thirteenth century it has belonged to the Turks. Many important Greek and Roman inscriptions have been found on the site.

AP'ANAGE. See APPANAGE.

APAR, ä'pär. See ARMADILLO.

APAREJO, ä'pá-rä'hô (Sp. pack saddle). A leather bag about 2 feet wide, nearly encircling the mule or horse on which it is placed. The aparejo is used in the United States army as a substitute for the pack saddle (q.v.). Two round hand holes are placed in the middle of each side, the two side pouches of the bag being braced by small ash or other elastic wooden sticks and stuffed with hay or moss. The advantages claimed are that it distributes the load to greater advantage than any other system of pack transport and secures better results from the animal. In the United States mountain artillery and pack trains the aparejo is used to the exclusion of all other systems of pack transportation.

APARRI, ä-pär'rê. A town of Luzon, Philippines, in the province of Cagayan, 54 miles north of Tuguegarao. It is situated on the northeastern coast, at the estuary of the river Cagayan, is the chief port for coasting and ocean trade on the north, and is the base for river navigation. Under Spanish domination it was the residence of a port captain. It is the northern terminus of a highway and telegraph line across the island to Manila. Pop., 1903, 18,252.

APARTMENT HOUSE. A building containing a number of distinct dwellings, or "apartments," of several rooms each. A tenement house conforms to this definition; and in New York and the United States generally, there is no legal distinction between tenements and apartment houses. In English and American usage, however, an apartment house differs from a tenement by superior design, finish, equipment, and cost; not by size, nor by number of rooms. The term "flats," sometimes applied in England to high-class apartments, is usually in the United States restricted to apartments in houses having no elevator or hall service. There are in American cities various classes of apartment houses, most of which have their analogues in at least the larger European cities. The chief are: (1) apartment hotels for either transient

or permanent occupants, having suites of from two or three to six or even seven furnished rooms cared for by the hotel servants, a hotel office, and a public restaurant, with other conveniences for families or individuals desiring to escape the cares of housekeeping; (2) ordinary apartments, usually of from five or six to nine or more rooms, besides from one to three bath-toilet rooms to each suite, such apartments being let by the year unfurnished; (3) bachelor apartments of two or three rooms and bath, furnished or unfurnished; (4) small unfurnished flats of three, four, or five rooms, for families of moderate means; (5) "duplex" apartments, each suite having rooms on two different floors; (6) studio apartments, having studios occupying the height of two stories, with dwelling rooms, etc., on two floors adjacent thereto; (7) coöperative apartment houses owned jointly by the tenants or by some of them, in which case the rents paid by the others go to the joint account of the owners. Some houses combine the features of two or more of the above classes. All American apartment houses of more than four stories (except some of the earliest built, and the "flats") have elevators, hall attendance, heat, hot-water supply, and electric lighting, and in many flats all these are found except the first two. In Europe generally most of these features are lacking, except in the newest and most expensive buildings. The most recent German examples, however, at least in Berlin, are said to rival or surpass the best American practice in these respects.

Features common to American apartment houses generally may be enumerated as follows: 1. A public entrance leading to a hall which gives access to elevators and stairs, usually with an adjoining reception room (unless itself fitted up as a reception hall); in many cases a telephone exchange, served either by a special clerk or by the hall attendant, provides communication with every apartment. 2. A special entrance for servants and tradesmen, leading to a dumb-waiter or service elevator and service stairs in the rear. 3. Each apartment has its outer door from the public lobby or stair-landing, opening into its own corridor either directly or through a so-called "foyer" or private reception hall. 4. Each apartment comprises a parlor, dining room, pantry, kitchen, bath-and-toilet room, and from two to five or six bedrooms. Larger apartments may have library, music room, dressing rooms, several servants' rooms, refrigerated storeroom, and several bath-and-toilet rooms. 5. Hot and cold water supply in kitchen, pantry, bathrooms, and dressing rooms. 6. Steam or hot-water heating. 7. Electric lighting. In many modern apartments and flats the kitchen is equipped for cooking by gas only, and in the more elaborate and costly houses a vacuum-cleaning plant and artificial refrigeration for the pantry or storeroom, are provided. In the smaller apartments the laundry tubs are in the kitchen; in the larger ones usually on a top floor in a general laundry (or rarely in the basement), and steam drying-closets are provided in connection with them. Servants' rooms are either connected with each suite or grouped all on an upper floor. Storage rooms are provided in the basement. Many houses have a restaurant or common dining room for those averse to the cares of cooking and of the table. Some apartments have roof gardens. There is the greatest variety in the

number and size of rooms. In European apartment houses generally the rooms are larger than in most American examples and the bedrooms, at least, better lighted. The European street lay-out, resulting in a fundamentally different ground plan of the house, permits of greater street frontage than is practicable in New York or in many American cities, and of lighting more rooms from the street. Moreover, the European houses (of which the Parisian are typical) are usually built around spacious courts, giving abundant light and air to even the minor service rooms, which in American houses (especially the older New York houses) are too often lighted and ventilated from narrow courts or shafts. Since the enactment of the Tenement House Law (q.v.) in New York the practice there has greatly improved, owing to the legal regulation of the sizes of courts—many houses having large interior garden courts; others, courts open to the front on the street. The defective street layout and the tendency to congestion in American cities have combined to limit the size of the rooms in apartment houses. The economy of space has been carried so far that in some Western examples the beds are by day folded into the wall out of sight, so that the same room may serve both as a reception room or living room and as a chamber—a highly objectionable and unsanitary device for making two or three rooms serve the purposes of four or five. The rental of apartments in New York, where they average higher than in most cities, ranges from \$30 to \$1000 a month, or at the rate of from \$6 to \$60 a month per room. In Paris, while the upper limit of rentals is as high as in New York, one can obtain much more spacious and desirable accommodation at the lower rates, say from \$40 to \$120 a month: the same is true of Berlin and Vienna, except that the upper limit is not so high.

Historical Development. In some European cities, like Paris and Rome, individual or one-family houses have for at least two centuries been attainable only by the rich, people of moderate means occupying hired lodgings in large buildings, each family having one floor ("flat," in English parlance) or half or quarter of a floor; in many cases in a "palazzo" or mansion fallen from its former glory, whose large apartments have been cut up into smaller rooms for humbler tenants. In Paris great blocks of apartments were erected under the Second Empire (1852–70), designed with considerable architectural skill, though lacking many of what Americans call "modern conveniences." In the better class of these *maisons de rapport* the façade is of monumental design, with continuous balconies above the basement and at the top story; the entrance driveway (*porte cochère*) into the court, the entrance lobby, stairs and stair halls, and the *salon* of each apartment, being treated with elaborate architectural finish. The rooms are large, but the kitchen equipment and plumbing are primitive, there is no elevator, rarely a bathroom (in the English or American sense), and no hot-water supply. Sunlight and air, however, abound. In the more recent French apartments, built since 1900, modern conveniences are more generally to be found, though the elevator is usually a small "automatic" affair whose use for descending is forbidden! The absence of good elevator service is due to the fact that the height of buildings is limited

by law, so that there are seldom more than five or six stories (*rez-de-chaussée, entresol, premier étage, deuxième étage, etc.*, and *mansarde*). In Germany and Austria the apartment houses have generally followed French models. In London the apartment house has never been very popular, and there is no well-marked type of design. The too prevalent refusal to lease apartments for less than two or three years, and the conservatism with regard to elevators and other conveniences, partly explain this. In the United States the earliest apartments, built in New York between 1870 and 1875 to meet the changed conditions following recuperation from the Civil War were primitive affairs, both in design and construction. A rapid extension and improvement came with the improvement of the elevator, the development of fireproof building, and the introduction of electric lighting, about 1880. A further stimulus was given by the adoption of steel-frame construction in Chicago and New York, and later by the consolidation of Greater New York in 1898. The growth in number, size, and splendor of New York apartment houses since 1900 has been phenomenal. During the past 20 years other cities have built apartment houses in great number, even small cities and suburban towns yielding to the movement, as providing a relief from many cares incident to life in a private house. For the apartment house, with its janitor service, hall attendance, central heating and hot-water supply, elevators, and apartments each with rooms on one floor, makes possible housekeeping with one or two servants (or even none at all), where from three to six would be required in a private house. Indeed, the difficulty of securing good domestic service in America has been the strongest influence favoring the development and multiplying of apartment houses. The prevalence of the system in Paris, Berlin, Vienna, and Rome is due to other causes, largely local. The influence of apartment-house life upon the family and society is a serious problem not yet studied as it deserves to be.

For the legislation concerning apartment houses, see TENEMENT HOUSE LAWS. For the general literature of the subject, consult the files of English, American, and European architectural periodicals; also Daly, *L'Architecture privée au XIX^e siècle* (Paris, 1877); Guadet, *Théorie de l'architecture*, vol. iii (Paris, 1902); Perks, *Residential Flats of All Classes* (New York, 1905).

APASTAMBA, ū'pā-stūm'bā. An ancient Sanskrit author, noted in connection with Vedic literature because of the *Srauta-, Grhya-, Dharma-, and Kalpa-Sūtras*, which bear his name. See VEDA.

APATIN, ō'pō-tin. A town of the kingdom of Hungary, in the county of Bács-Bodrog, situated on the left bank of the Danube, about 45 miles southwest of Maria-Theresiopel (Map: Hungary, F 4). Its chief industry is the manufacture of rope made from the hemp raised in the vicinity. A Roman intrenchment, the Römerschanze, 13 feet high and 20 feet broad, is the greatest point of interest. Pop., 1900, 13,940; 1910, 16,798 (mostly Germans).

AP'ATITE (from Gk. ἀπάτη, *apatē*, deceit, as the mineral has often been mistaken for other minerals). A mineral consisting of phosphate with some chloride and fluoride of calcium, its composition being represented by the formula $3Ca_3(PO_4)_2 + Ca(ClF)_2$. It occurs both

in crystalline and amorphous form and is largely used in the manufacture of fertilizers, for which it is valuable on account of the contained phosphoric acid. It occurs in both stratified and crystalline (metamorphic and igneous) rocks, especially in the latter. It is thus found in the older crystalline rocks in Canada, New York, Maine, and New Jersey; in Europe it is known in England, France, Saxony, Tyrol, Bohemia, Spain, Norway, etc.; but the only deposits of economic importance are those of Canada, Norway, and Spain. Most of the Canadian material that has been shipped contains 85 per cent of the phosphate of lime. In recent years the enormous deposits of rock phosphate or amorphous phosphate of lime have seriously injured the Canadian trade.

Phosphate Rock. Amorphous phosphate, or phosphate rock, is a name given to non-crystalline deposits of phosphate of lime occurring in more or less abundance at certain localities and of importance as a source of fertilizer. In the United States the most important deposits under active exploitation are in South Carolina, Florida, and Tennessee, but small quantities are obtained in Arkansas and some of the Rocky Mountain States. The Florida deposits, which have been worked since 1888, are found near the western coast. They occur as lumps imbedded in clay, known as rock phosphate; in pebble agglomerations, known as land pebble; or as a mixture of small pebbles and sand in the river bottoms called river pebble. The latter mixture is obtained by dredging, the sand being eventually separated by screening. The South Carolina deposits are found in an area about 60 miles long, between Charleston and Beaufort. The phosphate occurs in nodules buried in sand and clay, the productive bed being one to two feet thick. An acre yields 400 to 1200 tons. The South Carolina district was opened up in 1867. Both the Florida and South Carolina deposits occur associated with rocks of Tertiary age, and many teeth of sharks, elephants, etc., together with bones, are found with the phosphate. The phosphoric acid of the mineral is supposed to owe its origin to the accumulation of excrement and decaying animal matter deposited along the shores or in pools during Tertiary times, and to subsequent local replacement of limestone, or to concretionary segregation of phosphate of lime. In south central Tennessee, the phosphate is associated with Ordovician, Devonian and Post-Tertiary rocks. Enormous beds of phosphate have been recently uncovered in the States of Idaho, Utah, and Wyoming, constituting altogether the largest resources of that material in the world. They consist of rock phosphate, phosphatic shales, and cherty layers, with a thickness up to 200 feet, inclosed in Carboniferous limestone. They appear to offer an almost inexhaustible source of supply that will be drawn upon extensively, no doubt, when the southern deposits become depleted. The phosphate industry of the United States has assumed great importance in recent years, and much of the material is shipped to foreign countries. The annual output greatly exceeds that of any other country; though Tunis and Algeria have recently come into prominence as producers of the material. Crude rock containing less than 50 per cent of calcic phosphate is unsalable. Siliceous impurities are inert, but alumina and ferric oxide are bad, because they tend to change

the refined phosphate back to an insoluble condition. Lime, if present, neutralizes some of the sulphuric acid used in the manufacture of the fertilizer. The price of phosphate varies from year to year, and with its grade. The Florida hard rock averages the highest in phosphoric acid and commands extensive markets by reason of its accessibility to shipping points. The present output of phosphate rock in the United States exceeds 3,000,000 tons a year with a value, approximately, of \$12,000,000.

For general information, the reader is referred to the paper by Adolphe Carnot: "Sur les variations observées dans la composition des apatites, . . . Remarques sur le gisement et le mode de formation de ces phosphates" in the *Annales des Mines*, vol. x (Paris, 1896). Papers descriptive of the phosphate deposits of particular regions are: Branner, "The Phosphates of Arkansas," in the *Transactions of the American Institute of Mining Engineers*, vol. xxvi (New York, 1896); Hayes, "The Tennessee Phosphates," in the *Sixteenth Annual Report of the United States Geological Survey*, part iv (Washington, 1895). For information on the western phosphate deposits, consult papers by Gale and Richards, and a separate paper by Blackwelder, *Bulletin No. 430, United States Geological Survey*.

Bibliography. Brown, "The Phosphate Rock Deposits of Tennessee during 1897," *United States Geological Survey*, Nineteenth Annual Report, part vi (continued) (Washington, 1898); McCallie, "A Preliminary Report on a Part of the Phosphates and Marls of Georgia," *Georgia Geological Survey Bulletin, No. 5-A* (Atlanta, 1896); Eldridge, "A Preliminary Sketch of the Phosphates of Florida," *Transactions of the American Institute of Mining Engineers*, vol. xxi (New York, 1891); Smith, "The Phosphates and Marls of Alabama," *Transactions of the American Institute of Mining Engineers*, vol. xxv (New York, 1895); Penrose, "The Nature and Origin of Deposits of Phosphate of Lime," *Bulletin No. 46, United States Geological Survey*; Small, "The Phosphate Mines of Canada," *Transactions of the American Institute of Mining Engineers*, vol. xxi (New York, 1891); Wyatt, F., *The Phosphates of America* (New York, 1891).

APATU'VIA. See FESTIVALS; GREEK FESTIVALS.

APAYAO, ä-pí'you. A head-hunting people living in Apayao sub-province and Ilocos Norte, Luzon. They are a dialect group of the Tinguian. See PHILIPPINES.

APE (AS. *apa*, Ger. *Affe*). A monkey; any quadrumanous animal, especially one of large size, and belonging to the Old World. (See below.) Thus, the "apes of Gibraltar," or "Barbary apes," are macaques (q.v.), and some "sacred apes" are baboons. (See BABOON; MACAQUE; MONKEY.) More particularly the word nowadays applies to simians (family Simiidae), called "anthropoid apes," because they most resemble mankind.

The *Anthropoid Apes* consist of the chimpanzees, gorilla, and orang, the gibbons, together with several extinct and fossil species; but the three forms first mentioned are those usually in the mind of those who use the term in its popular sense. All approach, and some may exceed, man in size, frequently assume an erect attitude (though none are so much at ease in this position as are some gibbons), and resemble him in

ANTHROPOID APES



1



2



3



4

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1. ORANG-UTAN (*Pongo pygmaeus*).
2. (Left) SCHWEINFURTH'S CHIMPANZEE (*Pan schweinfurthi*).
(Right) GAMBIAN CHIMPANZEE (*Pan chimpanse*).

3. GORILLA (*Gorilla gorilla*).
4. SIAMANG GIBBON (*Symphalangus syndactylus*).

structure more closely than they do the apes and monkeys of other families. This is much more marked in young examples, however, than in the adults, which in advanced age become more and more brutish. This is particularly true of the characteristics of the skull, where huge, bony "crests" and super-orbital ridges develop, the canine teeth become greatly enlarged, and a revolting expression of face reveals the essentially savage and intractable nature of the animal, which, enforced by gigantic strength, renders these apes among the most formidable and ugly of wild beasts. The skeleton is substantially similar to the human skeleton, differing from it in greater size and weight and in certain proportions; the arms also are relatively much longer, and the legs shorter, and the great toe is longer and opposable only to a very limited degree. The spine lacks those curvatures in its lower part which enable man to stand erect with ease. In the flatness of the sternum and the absence of a certain small bone in the wrist these apes agree with man and differ from the monkeys. The skull is thicker, has in age great bony ridges, and projects at the muzzle; the teeth are of the same number and character as man's, but they are not set in a horseshoe form, but more nearly on three sides of a square, the front teeth making a decided angle with the cheek teeth, where the canines are developed into great tusks. The brain-case is smaller, and the bulk of the brain far less than that of man. Thus, according to Mivart, a normal human brain never measures less than 55 cubic inches, while that of the chimpanzee (the nearest) measures only 27½ cubic inches; the cerebrum is also relatively shorter. In its general form and structure, however, the brain of these apes is like that of man and is richly convoluted. There are no important differences in the soft parts of the body or their functions.

Externally, all the anthropoid apes are covered with black, brown, or reddish coarse hair, on all parts of the body except the face and palms, where the skin is dark, leathery, and wrinkled; the naked patches and callosities so frequently found upon the buttocks of the lower apes are absent or very small; nor are there any cheek pouches. There is no trace of a tail. The chimpanzee and gorilla are closely related to one another, but the orang is as distinct in structure from them as it is widely removed in habitat. All are inhabitants of the equatorial regions of the Old World, and restricted to forests, where they live in the trees, building rude sleeping platforms and shelters, and feeding wholly upon vegetable food—chiefly fruits. See CHIMPANZEE; GIBBON; GORILLA; ORANG-UTAN; MONKEY; and Plate of ANTHROPOID APES.

Consult: R. Hartmann, *The Anthropoid Apes*, illustrated (New York, 1886); Huxley, *Man's Place in Nature* (New York, 1898); and especially Elliot, *A Review of the Primates* (New York, 1913).

APEAK'. See ANCHOR.

APEL, ä'pel, JOHANN AUGUST (1771–1816). A German scholar and author. He was born at Leipzig, studied there and at Wittenberg from 1789 to 1793, and in 1801 was an alderman at Leipzig. He wrote several dramas, drawn largely from antiquity and slightly esteemed, a *Gespenssterbuch*, collections of short stories (4 vols., 1810–14), and a *Wunderbuch* (3 vols., 1815–17) both popular. The first of them contained the story of *Der Freischütz*, which formed the basis

for the text of Weber's opera of that name. He is perhaps best known for his *Metrik* (2 vols., 1814–16), which was a step forward in the understanding of ancient prosody.

APELDORN, ä'pel-dörn, or **APELDOORN**. A beautiful town in the Netherlands, province of Gelderland (Map: Netherlands, D 2). It is situated about 17 miles north of Arnhem, on a canal which joins the river Grift, a branch of the Yssel. Near Apeldorn is the royal château Het Loo, originally a hunting lodge of the Duke of Gelderland and a favorite palace of William III of England when Stadtholder. It is now the summer residence of Queen Wilhelmina. The principal industry is paper making, the produce of the numerous mills being in large part exported to the East Indies. Pop., 1890, 19,190; 1900, 25,761; 1910, 35,838; 1911 (est.), 37,517.

APELLES, ä-pěl'ēz (Gk. Ἀπελλῆς). The most celebrated painter in ancient times, the son of Pytheas, and probably a native of Colophon, on the Ionian coast of Asia Minor. The statements that he was a native of Cos or of Ephesus seem due to his long residence in those places. He was probably made a citizen of Ephesus, and may have died at Cos, which afterward possessed an unfinished painting by him. He lived during the latter part of the fourth century B.C. He first studied at Ephesus, under Ephoros, and afterward at Sicyon under the celebrated teacher Pamphilus of Amphipolis, where he may have learned the fine drawing in which he excelled. From Sicyon he seems to have gone to Pella in Macedonia, where he painted portraits of Philip and became the friend of Alexander, who sat to no other painter, though frequently to him, and permitted him much freedom of speech. His most celebrated portrait represented Alexander wielding the thunderbolt, of which it was said "of the two Alexanders, Philip's is invincible, Apelles's inimitable." He also painted portraits of some of the generals of Alexander. His most celebrated works were mythological or allegorical. Very famous were his "Anadyomene" (q.v.) and his "Artemis Surrounded by Maidens." Of his painting of "Slander," in which also appeared Ignorance, Suspicion, Envy, Deceit, Remorse, and other personifications, Lucian gives a detailed description which has inspired Botticelli, Dürer, and other artists. He seems to have returned to Asia after Alexander's conquests, and most of his celebrated works were found in Asiatic cities. At Rhodes he visited the painter Protogenes, and is said to have contributed to his reputation by offering a high price for one of his pictures. He was generous in his appreciation of his rivals, though fully aware of his own merits. He admitted that Melanthius surpassed him in grouping, and Asclepiodorus in symmetry, and that Protogenes was inferior only in never knowing when to stop, which deprived his pictures of the grace that Apelles claimed as his own. He seems to have been remarkable for his accuracy of drawing and fine coloring, probably due to a thorough theoretical and practical training. The industry with which he practiced drawing was so great as to give rise to the proverb which, in the Latin version, is *Nulla dies sine linea*. Many anecdotes are related of Apelles. When his works were exposed to public view, he used to place himself behind a picture, to listen to the criticisms of the common people. A cobbler having detected a fault in the shoe of one of his figures, it is stated that Apelles instantly

rectified it; but when the cobbler, on the following day, extended his criticism to the legs, the painter rushed from his hiding-place and told the cobbler to stick to the shoes, or, in the Latin version, which has become proverbial, *Ne supra crepidam sutor judicaret*. Consult: Pliny the Elder, *Historia Naturalis*, xxxv, 91 ff.; Woltmann and Woermann, *History of Painting*, vol. i (Eng. trans., New York, 1886); Houssaye, *Histoire d'Apelles* (Paris, 1867); Wustmann, *Apelles' Leben und Werke* (Leipzig, 1870).

APEL'LICON OF TEOS (died 84 B.C.). A wealthy bibliophile, born at Teos, but later a citizen of Athens. He gathered a great library, in part by purchase, in part by theft of original documents from the archives of Athens and other Greek cities. He is known now chiefly for the part he played in preserving the writings of Aristotle.

APELT, ä'pelt, ERNST FRIEDRICH (1812-59). A German philosophical writer, born at Reichenau. He studied at Jena and Leipzig and was made professor of philosophy at Jena in 1840. His works include: *Die Reformation der Sternkunde* (1852); *Die Theorie der Induktion* (1854); *Metaphysik* (1857); *Parmenidis et Empedoclis Doctrina de Mundi Structura* (1857); *Religionsphilosophie* (1860).

AP'EMANT'US. A churlish cynic in Shakespeare's *Timon of Athens*, supposed to have been modeled after the sketch of a similar character given in Lucian's *Public Sale of Philosophers*, a work with which Shakespeare might easily have been acquainted.

APENNINES, äp'e-ninz (It. *Appennino*; Lat. *Mons Apenninus*, Apennine Mount, from Cym. Celt. *pen*, hill, summit, promontory). A mountain chain belonging to the system of the Alps and extending uninterruptedly throughout the whole length of the Italian peninsula. Its separation from the Maritime Alps is purely conventional, there being no change of structure, and the beginning is usually taken to be about at longitude 8° E., the actual division being one of the passes there, generally that called Bocchetta dell' Altare, a few miles from Savona. From this point the chain, under the name of the Ligurian Apennines, girdles the Gulf of Genoa in the immediate vicinity of the sea, and then runs slightly south of east inland almost across the peninsula at lat. 44°, and then southeastward, forming the watershed between the Adriatic and the Mediterranean, but gradually approaching the eastern coast, till, in the highlands of the Abruzzi, it borders close upon it; after which it takes a more southerly direction, traversing Calabria. The formation of the uplift on the north coast of Sicily being the same as that in Calabria, the Apennines may be considered to continue and terminate in that island. The total length is about 800 miles, and the breadth varies from 25 to 85 miles.

Geographers divide the Apennines as follows: 1. The North Apennines, from the Col di Tenda, or the Bocchetta dell' Altare, in the Maritime Alps, to the pass of Borgo San Sepolcro, in the neighborhood of Arezzo, on the eastern border of Tuscany. 2. The Central Apennines, from Arezzo to the valley of the Sangro. 3. The South Apennines, from the valley of the Sangro to Cape Spartivento, terminating in the height called Aspromonte (6420 feet). To these may be added, as a fourth division, the Insular Apennines, or Sicilian Range. The first division is generally subdivided into (a) Ligurian, (b) Tuscan, (c)

Umbrian. The leading feature of the Apennines, wherever they approach the coast, is their extraordinarily steep declivities; while in Middle Italy and the adjoining portions of Upper and Lower Italy, long, terraced plateaus, lower ranges, and finally, relatively extensive coast plains mark their gradual descent on the west. The general name for these lower ranges is Sub-Apennine; but they have a variety of specific designations, such as the mountains of Carrara and Seravezza, Protomagno and Monte Amiata, in Tuscany; the Sabine, Alban, and Volscian mountains in the former Papal States; Monte Gargano on the southeastern coast, north of Manfredonia, etc. The main chain of the Apennines does not send off spurs into the Apulian Peninsula or heel of Italy, which in the main is rather level, or only interspersed with detached groups of hills. The principal chain exhibits for the most part a dreary and barren appearance, somewhat like a vast wall, with very few projecting peaks to break the dull monotony of the scene, and therefore seldom furnishes any salient points on which the eye of the spectator can rest with pleasure. Naked, riven, covered with thick débris, the declivities seem as if scorched by the southern sun. Only in the Abruzzi, in the Sub-Apennines, and especially in the marble-bearing mountains of Carrara and Seravezza do the bold and magnificent forms of the Alps reappear.

The average height of the entire chain of the Apennines is about 4000 feet, which, however, in the north sinks down to little more than 3500 feet, and in the mountains of the Abruzzi rises to 7000 feet. Here, in Monte Corno, the highest peak of the range, forming part of the Gran Sasso d'Italia, they reach an elevation of 9560 feet. The North Apennines attain in Monte Cimone, situated in the province of Modena, a height of 7103 feet. The highest peak of the South Apennines is Monte Polino, with an elevation of 7325 feet. On the highest peaks snow may be found at all seasons.

The Apennines are pierced by 13 principal passes. These are, proceeding from north to south: (1) the pass of Tenda; (2) of Bocchetta; (3) of Cisa; (4) of Monte Cimone; (5) of Poretta; (6) of Pietramala; (7) of Borgo San Sepolcro; (8) of Furlo; (9) of Serravalle; (10) of Aquila; (11) of Isernia; (12) of Arcano and Troa; (13) of Potenza.

Geology. The prevalent rock is a species of compact limestone, of a whitish-gray color, belonging to the Jura formation. Resting on the limestone is found a more recent formation of sandstone and marl, which is especially abundant in the middle region of the Sub-Apennines and contains an extraordinary number of fossils of the Tertiary Age. In the Apuan Alps and at several coast points remnants of older formations occur, but except these, and the rocks of the Calabrian portion where the prevailing limestone changes to crystalline and schistose rocks, the basic structure is Mesozoic and Tertiary. On the watershed of the north and central Apennines there are found Paleozoic clay-slate, graywacke-slate, etc. The Apennines, especially the Roman and Neapolitan, are distinguished from all other mountain chains by the rich variety of marbles which they contain. In some places the quarries seem inexhaustible. Igneous rocks are numerous in the middle and southern regions, where volcanic disturbances have produced many wonderful formations—as,

for instance, the crater lakes of Albano, Nemi, Vesuvius, Solfatara.

The direction of the great chain is favorable to the formation on the western side of important river basins, such as those of the Arno, the Tiber, the Garigliano, and the Volturno; while on the eastern side we find nothing but small streams, in most cases destitute of affluents, hurrying down to the sea through wild, precipitous valleys. In northern Italy the Ligurian Apennines, almost overhanging the Gulf of Genoa, develop on the southern slopes only puny streams, while their northern slopes send down, through the plains of Piedmont, large tributaries to the Po.

Flora. Where the Apennines, in general so poorly supplied with permanent streams, exhibit a trace of Alpine abundance of water, there is no lack of rich pastures and dense forests; but usually only thin grass and wild, scrubby bushes cover the stony slopes. The greater number of the roaring forest brooks in the deep, rocky ravines display during the summer only dry beds. Where the mountains dip down to the sea, as at the Riviera of Genoa and the Gulf of Naples, a rich, distinctively southern vegetation clothes the declivities. Gigantic agaves, Indian figs, myrtle bushes, orange groves, suggest in these northern lands the splendors of the tropics. The altitudinal vegetation zones are characterized as follows: Vine and olive up to 1300 feet; chestnut and oaks from 1300 to 3300 feet; pines from 3300 to 5200 feet; shrubs and grasses above 5200 feet, succeeded above by naked rocks.

APENRADE, ä'pën-räde. A town in the Prussian province of Schleswig-Holstein, situated at the head of a bay of the same name, opening into the Baltic Sea (Map: Prussia, C 1). It has an excellent harbor and considerable shipping trade. Pop., 1895, 5564; 1905, 7023; 1910, 7800. The town dates from the thirteenth century. It was destroyed by fire three times and in 1864 was captured by the Prussians. In the neighborhood is the Castle of Brundlund, built by Queen Margaret in 1411.

APEPI, or **APO'PHIS**. The name of two Egyptian kings of the Hyksos Dynasty. (See HYKSOS.) Little is known of either, and only a few scanty memorials of them have been found. Under APEPI I, whose date is very uncertain, science and letters seem to have flourished. The celebrated *Rhind Mathematical Papyrus*, a sort of practical handbook for the solution of arithmetical and geometrical problems, bears a colophon stating that the manuscript was copied, in the thirty-third year of this King, from an original written in the reign of Ameneinhat III. APEPI II flourished about 1650 B.C., and several monuments exist bearing his name. A papyrus in the British Museum (Sallier I) contains a legendary account of the breaking out of a war about religious matters between Apepi and Sequenen-rec, Prince of Thebes. It would seem, therefore, that Egyptian tradition regarded Apepi II as the Hyksos ruler in whose reign began the long war for the independence of Egypt.

APEREA, ä-pä'rê-ä. See CAVY; GUINEA-PIG.

APE'RIENTS. See LAXATIVE; PURGATIVE.

APET'ALOUS. See FLOWER.

A'PEX (Lat. the extreme end of a thing; point, summit). A term used in mining to designate the outcropping edge of a mineral vein or lode. As interpreted legally, it is not necessary that the edge of the vein should project above

the surface of the ground, but simply above the surface of the inclosing bedrock, and both vein and bedrock may therefore be covered by soil or drift. The term "outcrop" in the legal sense, as used above, does not agree with the geological application of the term in all cases; for if a vein dips nearly parallel with a sloping surface, and may be exposed at a point below the apex, due to an irregularity in its dip, this second exposure, while constituting an outcrop in the geological sense, would not be one legally. According to the Revised Statutes of 1872, a miner having the apex of a vein within the boundaries of his claim is allowed to follow it along the strike until it intersects the end lines of his claim extended vertically downward. On the dip, however, he is at liberty to follow it indefinitely, even if it extends outside the vertical side lines of his surface location. This prohibits another person from sinking to the first party's vein from a point outside the latter's surface claim. This apex rule has led to many lawsuits, some of which were costly, involving property worth several million dollars. Thus, where two veins join below the surface and each is worked by a different party, both may endeavor to claim possession of the true apex, but under the apex law slighter pretenses are sometimes used by one person to gain ownership of another's vein. See **LODE**; **MINING CLAIMS**; **OUTCROP**; **DIP**; **STRIKE**; **ORE DEPOSITS**; and consult Barringer and Adams, *The Law of Mines and Mining in the United States* (Boston, 1897; 1911).

APEX OF THE SUN'S WAY. A term used to denote that point of the heavens toward which the sun's motion in space is at present directed. Tobias Mayer of Göttingen was the first to speculate on the effect that the motion of the solar system as a whole would have on the relative positions of the fixed stars, in causing those ahead to open out and those behind to close in upon the line of motion. Sir William Herschel, by considering the motions of a comparatively small number of the brighter stars of the northern hemisphere, fixed on a point in the constellation Hercules as the solar apex. More recent investigations, involving a larger number of stars and carried on with all the modern refinements of astronomical measurement, have led to various estimates of the position of the apex, but it appears to be the general consensus of opinion that it lies in the neighboring constellation of the Lyre, a few degrees from the place indicated by Herschel. See **STARS**.

APHANIP'TERA. An order of insects, which includes the fleas, distinguished from the Diptera by having the three segments of the thorax "distinct and nearly equal, the two last rings (mesothorax and metathorax) bearing short, leaf-like appendages; and mouth-parts adapted for piercing."

APHASIA, ä-fä'zhī-ä, or -zī-ä (Gk. ἄφασια, speechlessness, from ἄ, a, priv. + φάσαι, phanai, to speak). Complete or partial loss of the power to express or understand the conventional symbols of language, resulting from disease of the brain centres involved. Aphasia may be classified as either motor or sensory, but the two forms may coexist. Motor aphasia results from inability to convey the necessary nerve impulses to the organs of speech. The motor speech area is in the third frontal convolution (Broca's convolution), and injury to this part of the brain or of the nerve tracts leading from it to

control the motions of the tongue and lips produce motor aphasia. With this affection the person may know what he wishes to say, but is unable to say it; he may be able to talk, but not say the words he wishes. All gradations of this affection, from slight to severe forms, exist, and it is one of the commonest forms of aphasia. There are several types of motor aphasia. When the patient is unable to write, he is said to have agraphia. Some victims of aphasia are able to write, but cannot enunciate words or sentences. The various degrees of this form of aphasia are severally termed aphemia, alalia, or anarthria, depending on the amount of impairment. Sensory aphasia, or amnesia, is a loss of memory for words. Three distinct types are recognized. 1. A simple loss of memory for words. 2. Word deafness or inability to comprehend spoken language. The auditory centre, or centre for auditory memories, that portion of the brain which hears and understands spoken speech, is in the first temporal convolution. Any defect of this centre, or of the fibres which go from it to the motor speech centre, produces what is known as word deafness. In this form the person may hear perfectly well, may read and speak, but does not understand spoken language. 3. Word blindness, or lack of power to understand written or printed words. The optical centre is located in the occipital lobes, and disease or injury of its cells, or of the fibres which lead from it to the motor speech centre, produces word blindness. In this form of aphasia the person, although capable of seeing, does not comprehend what he sees. He can talk and repeat aloud what is said to him, or write what may be said or what he reads. Several other sub-varieties of aphasia may be merely mentioned. Paraphasia denotes inability to connect ideas with the words proper to their expression; agrammatism, ataxaphasia, loss of the grammatical sense. Bradyphasia is abnormal slowness of speech. Aphasia is a symptom of many brain troubles. The most important cause is hemorrhage into the brain substance, involving the areas above described. Tumors, brain abscess, injuries of the brain, exhaustion, and some of the insanities may be accompanied by aphasia. The treatment is that of the underlying disease. Consult Gould and Pyle, *Cyclopedia of Medicine and Surgery* (Philadelphia, 1912).

A'PHEK. 1. A place north of Beirut (Josh. xiii. 4), having a temple to Ashtoreth, which was destroyed by Constantine on account of the impurity of the rites celebrated in it; probably the modern Khirbet Aphka at the source of Nahr Ibrahim. 2. One of the "twenty and two cities with their villages" belonging by inheritance to the tribe of Asher (Josh. xix. 30; Judg. i. 31). 3. A stronghold near Megiddo, where the Philistines assembled their army for the battles of Gilboa (1 Sam. xxix. 1) and Ebenezer (1 Sam. iv. 1), and from which Benhadad and Hazael (1 Kings xx. 26; 2 Kings xiii. 17) made their attacks upon Samaria. Over 100,000 of the Syrians are said to have been slain in one day's battle; the rest fled into Aphek, where 27,000 more were killed by a falling wall (1 Kings xx. 29, 30). It is probably identical with Apukn in the annals of Thothmes III (1501-1447), but this place has not yet been identified.

APHE'LION (Gk. ἀπό, απο, away + ἥλιος, helios, the sun). That point in the elliptical orbit of a planet which is most remote from the

sun. The opposite point, or that nearest to the sun, is styled the perihelion. At the former point the swiftness of the planet's motion is least and begins to increase; at the latter it is greatest and begins to decrease. This irregularity of motion is most remarkable in comets, since their orbits deviate most from the circle. See APSIDES.

APH'ELIOT'ROPISM, or NEGATIVE HELIOTROPISM. That form of sensitiveness by virtue of which plant organs direct their axes away from the source of incident light. Certain roots show this reaction to light; e.g., those of mustard seedlings. It is seen also in the tendrils of *Bignonia capreolata*. See HELIOTROPISM.

APHE'MIA. A form of aphasia in which the ability to write is retained. See APHASIA.

A'PHID (probably from Gk. ἀφειδής, *apheidēs*, unsparing, from ἀ, *a*, priv. + φείδεσθαι, *phaidesthai*, to spare). An insect of the family Aphididæ, commonly known as plant-lice, which live either free on the foliage, bark, or roots of plants, or inclosed in galls. They nourish themselves on the sap of their plant hosts, which they suck up through a long slender haustellum. They are minute, the largest being only one-fourth of an inch long. They are usually green or brown and somewhat pyriform in shape. Most of the forms that live on roots underground have neither compound nor simple eyes. Many species secrete a cottony, protective coat. At the posterior end of the abdomen most aphids have a pair of tubes from which they discharge a liquid for defense against their enemies, and also excrete from the anus a sweet liquid which is eagerly collected by ants and some other insects. This latter liquid is called "honey-dew" and often falls upon and varnishes the leaves of plants. When the wind is blowing it may fall to the ground as a fine spray. Although ants are indirectly injurious to plants by protecting or even cherishing the aphides, they may be said to be beneficial in collecting the honey-dew, since its presence on the leaves or stems is apt to form a favorable substratum for the growth of parasitic fungi which are injurious to the plants.

Dimorphism, or even polymorphism is very common among aphides. Thus the cospecific forms which live on the roots of plants and those that live on the foliage may exhibit certain structural differences. The sexes may be winged or wingless, and the females may lay eggs or bring forth their young alive. In the spring the fertilized eggs give rise to females, and these may produce females parthenogenetically for several generations, till later in the season, either at times of drought or on the approach of winter, both males and females make their appearance and become the parents of fertilized eggs. These eggs hatch the following spring as the "stem mothers," and the cycle is repeated.

Aphides stunt or kill growing tips, weaken entire trees by impoverishing their sap, and some species produce galls or other abnormal growths. They may destroy entire crops of cereals. Nearly all garden vegetables suffer from their ravages, and hot-house plants are particularly infested by them. The price of hops from year to year varies largely according to the abundance of the hop aphid. See HOP-LOUSE.

To the same group belongs the grape-vine phylloxera of Europe and America. Inundation of the ground during cold weather is fatal to

this pest. Carbon bisulphid and fumigation with tobacco, and spraying with neutral soaps are effective checks. Young fruit and shade trees may also be treated with soap washes, as well as with hydrocyanic-acid gas applied under closed tents. Birds, spiders, syrphus-fly larvæ, and ladybird beetles destroy great numbers of aphides and they are persecuted by deadly parasites. Indeed were it not for the many insect foes of aphides there would be little or no vegetation. The winter eggs of these insects may endure any amount of cold, but a cold, wet spell in the spring is often fatal to the newly hatched aphides. Among the most important species of this group are the "grain-lice," melon or cotton aphid, various peach and apple aphides, pea "louse," etc.

Bibliography. Thomas, *Eighth Report State Entomologist of Illinois* (Springfield, 1879); for Europe, Buckton, "Monograph of British Aphides," Ray Society (London, 1879-83). For bibliography of principal works on these insects see W. D. Hunter, *Bulletin 60, Iowa Agricultural Experiment Station* (Ames, Iowa, 1901).

A'PHIS-LI'ON. The larva of a lace-winged fly, especially of the family Hemerobiidæ, which feeds on plant lice. It is closely related to the ant-lions and golden-eyed flies. See LACEWING.

APHO'NIA (Gk. ἀφωλία, from ἀ, a, priv. + φωνή, phōnē, voice, sound). The term used in medicine to signify a more or less complete loss of voice. It is distinct from mutism, in which it is impossible to form articulate sounds, and in most cases the voice is not entirely lost. The voice is essentially produced by three distinct agents, viz., (1) the expiration of air, (2) the opening of the glottis, and (3) the tension of the vocal cords; and hence anything interfering with expiration, or with the functions of the glottis and vocal cords, may cause aphonia. Thus, it may result from paralysis of the respiratory muscles, from pulmonary emphysema, or pneumonia; or it may be caused by diseases of the larynx, as chronic laryngitis, œdema of the glottis, polypus, etc.; or by pressure on the larynx caused by abscesses, vegetations, and any kind of morbid growth; or it may be traced to some functional or organic disturbance of the vocal cords. The muscular fibres which act on these cords may become affected in acute laryngitis by extension of the inflammation, or their action may be impeded by the pressure of false membrane in croup. Aphonia may often be traced to compression of the recurrent or inferior laryngeal nerve, which is the nerve supplying motor power to all the muscles of the larynx except one. Such pressure is not infrequently caused by aneurism, abscess, or tumor. A wound or contusion of the pneumogastric nerve, or one of the recurrent branches, will cause aphonia or, more commonly, extreme hoarseness from paralysis of the laryngeal muscles on one side. Aphonia is, moreover, very commonly associated with hysteria.

APH'ORISM (Gk. ἀφορισμός, *aphorismos*, a limitation, definition, from ἀπό, *apo*, away + ὀρίζειν, *horizein*, to bound, divide). A maxim or any short and significant saying; such as "Habit is a second nature." Sometimes a complete work is written in the form of a series of aphorisms, arranged in due order, and leaving their connection to be traced by the reader's reflection.

APHRAATES, ā-frä'tēz. A Persian Christian of the fourth century, who, after his con-

version from heathenism, took the name of Jacob and was known as the "Persian Sage." He is said to have been an opponent of Arianism, and after his conversion lived at Edessa and later at Antioch. According to Prof. William Wright, he was bishop of the convent of Mar Matthew near Mosul and composed his works in 344, 345, and 377. His writings consist of 22 alphabetical homilies (ed. W. Wright, London, 1869; Graffin, Paris, 1894), and the separate homily *On the Cluster*, the text of which has been recovered lately. In the *De Viris Illustribus* (written before 496) of Gennadius of Marseilles, and in the ancient Armenian version, published by N. Antonelli (Rome, 1756), the homilies were ascribed to Jacob of Nisibis, who died in 338. The real author, however, is cited by name by Abhdisho, and by Elias of Nisibis (eleventh century), in his *Chroniele*. Consult: W. Wright, *Syriac Literature* (London, 1894); Duval, *Littérature Syriacque* (Paris, 1899); J. Forget, *De Vita et Scriptis Aphraatis* (Louvain, 1882); and Thalhofer, *Bibliothek der Kirchenväter* (Kempen, 1869-86), where eight of the homilies are translated. Ger. trans. by Bert in Von Gebhardt and Harnack, *Texte und Untersuchungen* (Leipzig, 1888); French by Parisot in *Edition Graffin*; English by John Gwynn in Schaff and Wace, *Select Library of Nicene and Post-Nicene Fathers*, vol. xiii (2d series, 1898).

APHRODISIA, ā'rō-dīz'ī-ā. The name given to the festival celebrated in honor of Venus. See GREEK FESTIVALS; VENUS.

APHRODISIAC, ā'rō-dīz'ī-āk (Gk. ἀφροδισιακός, *aphrodisiakos*, pertaining to Aphrodite, or Venus, goddess of love). A name applied to drugs that excite erotic desire, though the term may also include any physical or mechanical means employed for the same purpose. All drugs that are tonic in their effects and which promote the health of the body are indirectly aphrodisiac in their tendency. Such are strychnine, iron, quinine, etc. True aphrodisiacs are very rare, and it is doubtful if there be any whose use is not injurious if given in effective doses. Such are hashish (*Cannabis indica*), cantharides, a violent and dangerous irritant, *Blatta orientalis*, and *Damiana*, a preparation made from a species of *Turnera* found in Mexico. Drugs having the contrary effect are called anaphrodisiacs (q.v.).

APHRODITE, ā'rō-dī'tē. See ANADYOMENE; VENUS.

APH'THÆ (Gk. ἄφθα, *aphtha*, eruption, ulceration). Small round or oval whitish patches, plaques or ulcers surrounded by a red border and very painful, which appear on the mucous membrane of the mouth, in the affection known as aphthous stomatitis. The favorite sites of these patches are the sides of the tongue, or its under surface, or in the fold between gums and lips. It is a disease of the dentition period of children, although adults are sometimes attacked. The irritation of dentition and general lowered vitality are predisposing causes, while faulty oral hygiene, unclean nursing bottles, decomposing particles of food and the like are the exciting factors. No specific germ has been definitely associated with aphthæ, nor has the affection been proved to be contagious. The treatment consists in cleansing the mouth with mild antiseptic washes, touching the ulcers with nitrate of silver or other caustics, and paying strict attention to oral cleanliness. This affection is not to be confused with Thrush (q.v.).

APH'THOUS FE'VER. See FOOT AND MOUTH DISEASE.

APH'YDROT'ROPISM, or NEGATIVE HYDROTROPISM. That form of sensitiveness by virtue of which a plant organ turns its axis away from the source of diffusing moisture. The phenomenon is seen in the fruiting bodies of many fungi. The vegetative filaments remain in the moist substratum (being positively hydro-tropic), but the reproductive filaments, which bear the spores, grow out into the much drier air. See HYDROTROPISM.

APIA, ä'pě-ä. The principal town in the Samoan Islands, South Pacific Ocean. It is situated on the northern coast of the German island of Upola, in lat. 13° 49' S., long. 171° 48' W. It has an open harbor and is the chief commercial centre of the Samoan group. Most of the trade is British, and cocoa and copra are the principal exports. The town consists chiefly of one long street running along the harbor. There is a Roman Catholic church, several schools, and a district court. On March 15, 1889, Apia was visited by a disastrous hurricane, in which several vessels, including one American and two German warships, were destroyed, and 146 lives lost. Apia was constituted a municipality in 1899 and was for a time under the joint supervision of the British, American, and German consuls. Its population in 1910 was about 1450, of whom about 400 were Europeans. Apia is the seat of a United States consulate. See SAMOAN ISLANDS.

A'PIA'CEÆ. See UMBELLIFERÆ.

A'PIA'NUS, PETRUS (1501-52). A German astronomer and geographer, born at Leisnig, Saxony. His name was Peter Bennewitz, or Bienewitz (*Biene* is German for bee, which in Latin is *apis*—whence his adopted name). He was, from 1527, professor of mathematics at Ingolstadt and was celebrated as a mathematician, astronomer, and general savant, and especially as a cosmographer. He was the inventor of a number of philosophical instruments, and some of the earliest maps of America were printed by him. The best known among his writings is the *Cosmographia* (Landshut, 1524; Antwerp, 1529).

APICES, äp'î-sēz. See NUMERAL.

APICIUS, ä-pîsh'î-ūs, MARCUS GABIUS. A Roman epicure, who lived in the time of Augustus and Tiberius and was celebrated for his luxurious table and his acquirements in the art of cookery. When, by the gratification of his favorite indulgence, he had consumed the greater part of his fortune, and had only some \$400,000 left, he poisoned himself, in order to avoid the misery of plain diet. Two other gourmards—one in the time of Pompey, the other in the reign of Trajan—are mentioned under the name Apicius. The Roman cookery-book, *Cælii Apicii de Re Coquinaria*, ascribed to Apicius, belongs to a much later time, as it abounds in inaccuracies and solecisms. It is edited by Schuch (Heidelberg, 1867).

AP'ICUL'TURE. See BEE-KEEPING.

APINUS, ä-pě'nus, FRANZ MARIA ULRICH THEODOR (1724-1802). A German physicist, born at Rostock. He devoted himself to the study of medicine and the exact sciences, and in 1757 he was appointed professor of physics at St. Petersburg. He is chiefly remembered for his extension of Franklin's electrical theory, but also published valuable works on various other branches of the physical sciences, including a

work *On the Distribution of Heat at the Surface of the Earth* (1762).

A'PION (Gk. Ἀπίων). An Alexandrian grammarian of the first century A.D. He was born in the Oasis in the Libyan Desert, but came early to Alexandria, where Didymus (q.v.) received him into his house. He became a pupil of the grammarian Apollonius and Euphranor and eventually succeeded Theon as head of the Alexandrian school. (See ALEXANDRIAN AGE.) He traveled much in the cities of Greece, lecturing on Homer, whereby he gained great renown, but more from the brilliancy of his manner than from the value of the matter presented. His journeys extended to Rome, where his boastful nature won him from the Emperor Tiberius the nickname *cymbalum mundi* ('the cymbal of the universe'). The Alexandrians gave him citizenship; later, as leader of the anti-Jewish party, he was sent during the reign of Caligula at the head of an embassy to Rome to oppose the Jewish delegation led by the philosopher Philo. Josephus's tract, *Against Apion*, answering charges made on this occasion, is one of our chief sources of knowledge in regard to him. In the reign of Claudius Apion lived and taught at Rome. His chief writings were a comprehensive work, in five books, on the history and civilization of Egypt, which contained the famous story of Androcles (q.v.) and the Lion, preserved by Aulus Gellius (v, 14), and the tale of the love of a dolphin for a beautiful boy, also preserved by Gellius (vi, 8); and a Homeric glossary, which has been thought to be identical with that in the appendix to the *Etymologicum Gudianum*, p. 601, ed. Sturz (Leipzig, 1818), though probably without good reason. The scanty fragments of his historical works are collected by K. and Th. Müller, *Fragmenta Historicorum Græcorum*, vol. iii, pp. 506-516 (Paris, 1868-74).

A'PIOS TU'BERO'SA. See GROUND-NUT.

A'PIS (Gk. Ἄπῖς). A sacred bull worshiped at Memphis by the ancient Egyptians. His Egyptian name, *Hap*, is of uncertain etymology. Originally he may have been an independent local divinity, but in historical times he appears as the sacred animal of the god Ptah of Memphis. Later he was considered as an incarnation of Osiris, of Sokaris, or even of the sun; but usually he was, through a false etymology, associated with the Nile (*Ha'pi*). According to Greek accounts, he was not allowed to live longer than 25 years, and if he survived his allotted time was secretly drowned in a well. The bodies of the Apis bulls were carefully embalmed and were buried in subterranean rock-hewn tombs, in the Serapeum at Memphis (not to be confounded with the famous Serapeum of Alexandria), where Apis, under the name Serapis (a combination of Osiris and Apis), was worshiped as the patron of the dead. Three tombs, with numerous Apis mummies, were discovered by Mariette in 1851. After the death of an Apis bull, the country was searched, sometimes for years, until another was found bearing the sacred marks. As to the precise nature of these marks, traditions vary widely. The animal, however, must be black, with certain white spots, and a peculiar knot under the tongue. When found, he was solemnly conducted to Memphis and installed in the temple with great festivities. The day of his installation and that of his birth were celebrated annually, and oracles were derived from his movements and from the

nature of his appetite. Even the cow which had become the mother of an Apis bull received divine honors. The sumptuous worship of this animal seems to have impressed the Greeks as more remarkable than that of any other sacred animal. For illustration, see EGYPT.

AP'LACOPH'ORA. See AMPHINEURA.

AP'LANATIC LENS (not wandering, from Gk. *ἀ*, *a*, priv. + *πλανᾶσθαι*, *planasthai*, to wander). An achromatic lens corrected for spherical aberration (q.v.), so that all rays of light which emanate from one point and pass through the lens are focused at a point. The construction and correction of photographic lenses are fully described, from the technical standpoint, in Otto Lummer's *Photographic Optics*, translated by Silvanus P. Thompson (New York, 1900). See LIGHT; LENS.

APLITE. See GRANITE; ALASKITE.

APNŒA (Gk. *ἀπνοια*, from *ἀ*, *a*, priv. + *πνεῖν*, *pnein*, to breathe). Partial or complete suspension of respiration. It takes place when the blood is too highly oxygenized and fails properly to stimulate the respiratory centres. See also ASPHYXIA; DYSPNŒA.

APOC'ALYPSE. See REVELATION.

APOC'ALYP'TIC LIT'ERATURE' (Gk. *ἀποκαλύπτειν*, *apokalyptein*, to uncover, reveal). The designation of certain prophecies and revelations of Jewish and Christian authorship dating from about 200 B.C. to about 150 A.D. Their general subject is the problem of the final triumph of the Kingdom of God. The Jewish apocalypses profess to reveal the future glory of Israel, i.e., the divine vengeance on her enemies and oppressors and her enjoyment of an era of wonderful happiness. In the earlier apocalypses the new age is to be realized on earth and by the righteous only. The judgment on the wicked will be a physical one, by war, pestilence, and death, and the holy land and city will be the special objects of divine favor. In the later works more interest is taken in the transcendental world of spirits, angels, heaven, and hell. In some apocalypses a personal Messiah as the central figure of the new age is very prominent; in others he holds a secondary place or is not considered at all. Alterations and interpolations by Christian hands, making the alleged predictions point more definitely to Jesus, gave certain of these Jewish works a very wide circulation in the early Church.

The purpose of these works, all written in times of trial and disaster, was to vindicate God's ways to the faithful, who were sorely tried by the apparent triumph of the wicked, i.e., the heathen nations without and the irreligious within Israel. The fundamental ideas represented are those of the Pharisaic Judaism of the more popular, non-scholastic type—legalistic indeed, but full of passionate earnestness. This literature is mostly pseudepigraphic. The revelations and predictions are set forth as though actually received and written or spoken by ancient worthies, as Enoch, Moses, etc. But it is not difficult, in many cases, to see that the pretended prediction is but the résumé of past history. Where the pseudo-prophecy ends and the attempt at prediction really begins, the author is seen to be dealing with his own times, and the date of the work is thus betrayed.

The tone of these works is one of such assurance that they were once widely accepted as genuine prophecies, and found a warm reception in Jew-

ish and early Christian circles. In time most of these works came to be looked upon with disfavor, except in the less enlightened circles of the Christian Church. Though all were originally written in Hebrew, Aramaic, or Greek and all once circulated in a Greek form in the early Church, several of the most important are known to-day only in such translations as the Ethiopic or Syriac, and many others have utterly perished. This literature is of the highest value to-day because of the light it throws on the growth of eschatological and Messianic doctrines among the Jewish people just previous to the rise of Christianity, especially since these doctrines have, in a purified form, found a permanent place in the Christian system.

The extant Jewish apocalypses are the following: 1. *The Book of Daniel*, composed about 165 B.C. (See DANIEL, BOOK OF.) 2. *The Book of Enoch*. A compilation from at least five different Enoch books. The earliest of these goes back to the Hasmonæan period. Of greatest importance for the history of the Messianic hope is the book called "The Parables of Enoch" (chaps. xxxii-lxxii of the whole collection). Concerning the date of this book there is as yet no consensus of opinion among scholars. It also contains extensive interpolations from an apocalypse of Noah. (See ENOCH, BOOK OF.) It contains much about angels and supramundane matters. The book is quoted in Jude 14. 3. Another Enoch book, *The Secrets of Enoch*, composed c.50 A.D., is now extant only in a Slavonic translation. 4. *The Sibylline Oracles*. Jewish imitations of the utterances of the heathen Sibyls. The present collection in 14 books represents the growth from beginnings made by Hellenistic Jews in the second century B.C. The later portions are by Christian hands. The oldest and most important parts are in book iii, lines 97-828. These oracles were highly esteemed and frequently quoted by the early Church Fathers. 5. *The Psalms of Solomon*. A collection of 18 patriotic and religious psalms, written originally in Hebrew some time after Pompey had made Judæa subject to Rome (63 B.C.). Until recently these were known only in a Greek translation, but in 1909 Rendel Harris published a Syriac translation of Psalms i-xvii. The apocalyptic element in these is very small. Psalm xvii contains strong Messianic hopes. These psalms are interesting for comparison with the early Christian hymns in Luke i and ii. 6. *The Book of Jubilees*. A revelation made to Moses of the course of events from Adam to Moses's own day. The history is divided into 50 periods of 49 years each; hence the name of the book. The outline is that of Genesis, but great liberties are taken with the text. The patriarchs are made the exponents of the writer's strict Pharisaic views and hopes. The book was written probably between 135 and 105 B.C. 7. *The Testaments of the Twelve Patriarchs*. The dying exhortations of the twelve sons of Jacob to their children. Each testament deals with some virtue or fault which the patriarch exemplified in his life and also contains predictions relating to the future of his descendants. These predictive portions have been largely worked over by Christian hands. The original Jewish work was composed about 109 B.C. by an ardent partisan of the rule of the Maccabæan priest-princes. It was later revised by an opponent of these princes about 70-40 B.C. 8. *The Assumption of Moses*, or *Testament of Moses*,

was written shortly after the death of Herod (4 B.C.). It gives the parting communications of Moses to his successor, Joshua, in which he unfolds the course of Israel's history down to the time of the successors of Herod, after which the writer claims that the Messianic age will come. 9. *The Apocalypse of Baruch*. One of several *Baruch* books once current in Jewish circles. It contains material of different dates from 50 to 90 A.D., and illustrates the Messianic hopes of Pharisaic Judaism just before and after the fall of Jerusalem, 70 A.D. On this account it is one of the most important of apocalyptic works. 10. *Fourth Esdras* (*Second Esdras* in the English Apocrypha of the Old Testament) contains seven alleged visions of Ezra, the famous scribe. His grief over the hard fate of Zion is relieved by the revelation of the coming Messianic era and punishment of the wicked. The book was written by a Jew, probably about 81-96 A.D., but has been slightly revised and added to by Christian hands. The work is also important because of its profoundly theological character in its serious and almost despairing grapple with the problems of sin and its consequences. For a complete list of Jewish Apocalypses, of which the titles alone remain, see Schürer, *History of the Jewish People in the Times of Jesus Christ*, §§ 32-33.

Of the Christian Apocalypses the most important is the canonical *Book of Revelation* (q.v.). Other less important ones are: *The Apocalypse of Peter*, of which a small fragment has recently been discovered treating of the place of eternal punishment. *The Apocalypse of Isaiah*, which treats of the history of the Church to the Neronian persecution, after which the final age is to appear. *The Shepherd of Hermas*, composed by Hermas, brother of Pius, Bishop of Rome c.150.

In the foregoing article no mention has been made of the very large number of apocalyptic writings of distinctly Christian origin which were produced from the second century onward, to satisfy an unhealthy craving for the occult and marvelous or to embellish the stories of the saints.

Bibliography. Deane, *Pseudepigrapha* (New York, 1891); Schürer, *History of the Jewish People in the Times of Jesus Christ*, §§ 32-33 (trans., New York, 1885-91); article "Apocalyptic Literature" in the *Encyclopædia Biblica* (New York, 1899). For English readers the most valuable editions of the Jewish Apocalypses are those by R. H. Charles (of all but Nos. 4, 5, and 10), and *The Apocrypha and Pseudepigrapha of the Old Testament* (ed. by Charles, Oxford, 1913).

APOCALYPTIC NUMBER, THE. The mystical number which is given in Rev. xiii. 18 as the designation of the beast of the ten horns and seven heads (v. 1), and which, in the accepted text, reads "six hundred and sixty and six."

Many interpretations of this number have been given by *Gematria* (q.v.). In view of the fact, however, that the author of the book, as is evident from the context, intended to represent some powerful and hostile personality in his own time whose identity was to be recognized by the circle of readers to whom he was writing, but hidden to all others, the interpretations can be largely reduced. The one most generally accepted and perhaps most probable is that—on the basis of the Hebrew numerical alphabet, which con-

tains no characters for *e* or *a*—the author intended to represent Nero—

N (e)	R	O	N	K (e)	S (a)	R	}	666
50	200	6	50	100	60	200		

It is claimed, however, that there is variant reading for the text that gives the number "six hundred and sixteen," which, on the basis of the Greek numerical alphabet, would represent Gaius (Caligula)—

G	A	I	O	S	K	A	I	S	A	R	}	616
3	1	10	70	200	20	1	10	200	1	100		

In confirmation of this second reading, it is urged that an author writing for Greek readers would be more likely to use the Greek alphabet, with which they were familiar, than the Hebrew, with which they were unacquainted. But it is to be noticed that in ix. 11, a Hebrew as well as a Greek word is used for the mystical idea the author has in mind ("... the angel of the abyss, in Hebrew called Abaddon, and Greek Apollyon"), and xvi. 16, a Hebrew word alone, ("... the place which is called in Hebrew, Har-Magedon"). It is not impossible, therefore, that Hebrew letters were intended to be represented by the number here given. In fact, the variant reading may have quite naturally come from the voluntary omission by copyists of the second *n* of *Neron* in the first reading, Nero being the more familiar form. See ANTI-CHRIST; REVELATION OF SAINT JOHN.

APOCALYPTIC WRITINGS. See APOCALYPTIC LITERATURE; APOCRYPHA.

AP'OCATAS'TASIS (Gk. ἀποκατάστασις, *apokatastasis*, restoration). A word found in Acts iii. 21 (compare Rom. viii. 21, Eph. i. 9, 10, Col. i. 19). It has been interpreted by some as pointing to the final salvation of all men and has been employed as a technical term with this signification. See UNIVERSALISM.

AP'OCHROMATIC LENS. See MICROSCOPE.

APOC'RYPHA (Gk. ἀπόκρυφος, *apokryphos*, hidden, concealed, from ἀπό, *apo*, away + κρύπτειν, *kryptein*, to hide). A term used to designate books that are not regarded as canonical, though they have been read, cherished, and often quoted as Scripture in synagogue and church. As to the origin of this term, it is not certain whether it is a translation of the Hebrew word *genuzim* or came into vogue because it had already in Greek been used for "secret" books. The verb *ganaz* means 'to store away,' 'to withdraw from use,' and the root idea suggests that it is something precious that is hidden. Worn-out scrolls of the law were removed to the Genizah. But books that were not considered to possess such a sanctity that they required a ceremonial washing after contact with them were also stowed away, removed from public use. Thus the term is used in connection with the process by which the canon was reduced to its final form; the sages intended to "withdraw" Ecclesiastes, they actually decided to "withdraw" Ecclesiasticus. Many books that were in this manner withdrawn were particularly cherished in some circles, because they were regarded as containing the secrets of the universe and of the future. Fourth Esdras makes a distinction among the books given by divine inspiration; 24 are intended for the wise and the foolish, the rest are secretly handed over to the wise (xiv. 26, 46). But these treasures, so dangerous to the peaceful

development of the people, were withdrawn by the sages; even Daniel was relegated from "the prophets" to the third group, "the writing." It seems probable that 'to remove,' 'to withdraw,' is a secondary meaning, and that the original meaning was 'to treat as a treasure,' 'to cherish,' 'to hold as a precious secret.' This then approaches the significance of the word in the title of a Leyden magical papyrus "The Sacred Apocryphal Book of Moses Called the Eighth or Holy Book," "The Apocryphal Books of the Phœnicians" from which Pherecydes of Syros is said by Suidas to have learned his wisdom, and "The Apocryphal Books of Zoroaster," of which, according to Clement of Alexandria, the Gnostic Prodicus had a copy. Unfortunately, we do not know whether any of these titles is earlier than the appearance of the term *ganaz* in Hebrew writings, or what expressions were used by the Essenes and the Therapeutæ to designate their hidden books. After the final establishment of the Hebrew canon, many works that had been secluded, or otherwise were not approved, were simply referred to as "the outside books." To some such writings, found in the Greek Bible, but not in the Hebrew, Jerome applied the term "apocrypha," and the same designation actually came to be used of books that in the formation of the New Testament canon were left outside.

From the standpoint of ecclesiastical usage there is a number of books that forms a distinct group and has held a peculiar position. It is composed of (1) *Ecclesiasticus*, or the Wisdom of Jesus, son of Sirach, (2) *Wisdom of Solomon*, (3) *Baruch* with the *Epistle of Jeremiah*, (4) *Tobit*, (5) *Judith*, (6) *1 Maccabees*, (7) *2 Maccabees*, and (8) some sections of *Esther* and *Daniel* found in the Greek text, but not in the Hebrew or Aramaic. These had a place in the Greek Bible and all its daughter versions as well as in the Latin Vulgate, were read as Scripture in the early Christian Church and throughout the Middle Ages, were declared by the Council of Trent, at its fourth session, in 1546, to be "inspired and canonical," and are so held by the Roman Catholic church and some of the Greek and Oriental churches. A certain distinction is recognized between them and the books in the Hebrew Bible, but only in time, not in degree of inspiration or canonical authority; and they are now, as in the past, often referred to by Roman Catholic scholars as "deuterocanonical." On the other hand, the Protestant churches since the Reformation, the Greek Orthodox church of Russia, at least since the latter part of the eighteenth century, and some other churches under Protestant influence have declared them to be "apocrypha" and denied their inspired and authoritative character. The reformers kept them in their Bibles and recommended them for purposes of edification, though not for "the establishment of doctrine," and until the eighteenth century it was customary to give them a place between the Old and New Testaments. But the struggle concerning the canonicity of these books led to their rejection, so that the great Protestant Bible Societies no longer publish Bibles containing them. The Church of England is alone in not rejecting their use in worship. At the present time, however, there is a revived interest in them, and they are being made more accessible to Christians in Protestant countries. Each of these books is discussed in a separate article, and for the question as a whole see

DEUTEROCANONICAL BOOKS. Aside from the books whose canonicity was decided by the Council of Trent there are some found in the Greek or Latin Bibles which are often included by Protestants with what they call Apocrypha. Such are *1 Esdras*, also called *3 Esdras*, which appears to be only another and possibly an earlier Greek translation of our Hebrew Ezra, (2) *2 Esdras*, also called *4 Esdras*, an apocalypse found in Latin and various other versions, originally written in Aramaic, and (3) *The Prayer of Manasses*, originally an addition to 2 Chronicles. Except in some of the Oriental churches, these are not now regarded as canonical, and fall under the head of apocrypha. If the term "deuterocanonical" is used, as seems proper, for the books so designated by Roman Catholic scholars, there is no need of employing the term "pseudepigrapha" for what they call "apocrypha." Pseudepigraphy, a wrong claim or tradition in regard to authorship, is not a distinguishing characteristic of this literature. The apocrypha are divided into two classes according to their Jewish or Christian origin.

I. **Old Testament Apocrypha.** We possess several lists of apocrypha drawn up in the ancient Church, such as the Stichometry of Nicephorus, the Athanasian Synopsis, a catalogue published by Montfaucon, an enumeration in the Apostolical Constitutions, and the Gelasian Decree; and many works are referred to by patristic writers. Of these some have come down to us, in whole or in part, while others have not yet been recovered. They may be divided into historical legends, testaments, apocalypses, philosophy, and poetry. Among the legends mention should be made of *The Life of Adam and Eve* (see ADAM, BOOKS OF); *The Book of Jubilees* (q.v.); *The Martyrdom of Isaiah*, which has been preserved in the first part of the Ethiopic book *The Ascension of Isaiah*; the Story of the Three Pages in *1 Esdras*; *The Prayer of Manasses*; *The Letter of Aristeas to Philocrates* (see ARISTEAS); the stories told in the fragments of *Artapanus* (q.v.) and *Eupolemus* (q.v.); *3 Maccabees*, a story of the wonderful deliverance of the Jews in Alexandria in the time of Ptolemy IV Philopator (221-205 B.C.); *The Story of Aseneth*, the wife of Joseph; and such later works as *The Book of Jasher* (q.v.), *Josippon* (q.v.), *The Contradictio Salomonis*, a contest in wisdom between Solomon and Hiram; the *Liber Antiquitatum Bibliarum*, ascribed to Philo; *The Chronicles of Jerahmeel* (q.v.). Among the testaments the most important are: *The Testament of Abraham*, preserved in Greek and Slavonic; *The Testaments of Isaac and Jacob*, preserved in Arabic and Ethiopic; *The Testaments of the Twelve Patriarchs*, preserved in Greek, Armenian, and Slavonic, probably dating from the second century B.C.; *The Testament of Naphtali*, preserved in a later Hebrew translation; *The Testament of Job*, preserved in Greek (see JOB, TESTAMENT OF); *The Testament of Moses*, probably preserved, as Moore has suggested, in the part of *The Assumption of Moses* now extant in a Latin translation; *The Testament of Solomon*, translated by Conybeare in *Jewish Quarterly Review* (1899); and *The Rest of the Words of Baruch* or the *Paralipomena Jeremiae*, preserved in Greek and Ethiopic. Among the apocalypses there are: *The Book of Enoch* (q.v.), preserved in Ethiopic and partly in Greek; *The Sibylline Oracles*, in Greek; *The Assumption of Moses*, preserved in

part in Latin; the *Syriac Apocalypse of Baruch* (see BARUCH); *The Greek Apocalypse of Baruch* (see BARUCH); *The Secrets of Enoch*, preserved in Slavonic; *1 Esdras*, or *The Apocalypse of Ezra*, preserved in Latin, Syriac, Ethiopic, Arabic, and Armenian (see EZRA, APOCALYPSE OF); *The Apocalypse of Elijah*, preserved in the Coptic and published by Steindorff in 1899; *The Apocalypse of Zephaniah*, preserved in Coptic and published by Steindorff in 1899; *The Prophecy of Eldad and Modad*, quoted by Hermas (ii, 34); and *The Book of Og the Great* and *The Penitence of Jannes and Jambres*, referred to in the Gelasian Decree. As late as in the twelfth century an *Apocalypse of Daniel* appeared, in which there is a distinction between the Messiah, son of David, and the Messiah, son of Joseph, which is discussed by Darmesteter in *Mélanges Rénier* (1887). *Fourth Maccabees* is a philosophical treatise on "The Supremacy of Reason." It is in Greek and has been wrongly ascribed to Josephus. The most important collection of apocryphal hymns of Jewish origin are those found in *The Psalter of Solomon*. These hymns, 18 in number, were originally written in Hebrew. They were composed about the middle of the first century B.C. and have been preserved in Greek and, except the last, in Syriac. Five other psalms preserved in Syriac have been published by Wright in *Proceedings of the Society of Biblical Archaeology* (1887). One of them is identical with the additional Psalm cxi in our Greek Bibles. Since most of this literature has passed through Christian hands, there are, especially in the apocalypses, occasional Christian interpolations. See also APOCALYPTIC LITERATURE.

II. **New Testament.** The New Testament apocrypha include numerous works purporting to have been written by apostles or their associates, but not able to secure a general or permanent recognition. These may be classified thus: (a) Gospels; (b) Acts of Apostles; (c) Epistles; (d) Apocalypses; (e) Didactic Works; (f) Hymns.

(a) Apocryphal gospels may be divided into several groups. 1. Those dealing with the nativity and childhood of the Virgin Mary, and the birth, infancy, and childhood of Jesus. Probably the earliest of these is the *Protevangelium of James*. It is but an enlargement of the nativity narratives in the canonical Matthew and Luke, and may have been written in the second century. Closely connected with the *Protevangelium* is the *Gospel of Thomas*, which treats of the childhood of Jesus. He is represented as even then working miracles and as fully conscious of his divine mission. This work was much used by Gnostics. It is to be dated not later than 150 A.D. The matter contained in these two works was combined with additions and variations in the later *Nativity of the Virgin Mary*, ascribed to Matthew. A still later form of the same material is found in the so-called *Arabie Gospel of the Infaney*, which devotes much space to the experiences of the Holy Family in Egypt. In *The History of Joseph the Carpenter* Jesus is represented as telling his apostles of his mother's betrothal, of his own birth, and, more particularly, of the last sickness and death of Joseph. 2. There is a second group of writings treating of the passion and post-mortem experiences of Jesus. *The Gospel of Nicodemus* is a late compilation of two earlier and altogether separate works, *The Acts*

of Pilate and *The Descent of Christ into Hades*. *The Acts of Pilate* is probably the older, but in its present form an enlargement of the reputed official acts or reports of Pilate, to which reference is made by Justin Martyr (c.150 A.D.). The second work is mainly an imaginary narrative represented as having been told by two men raised from the dead at the time of the crucifixion (compare Matt. xxvii. 52-53). 3. More important than these are the gospels of the same type as those in the New Testament canon. *The Gospel according to the Hebrews*, probably the same as the *Gospel of the Nazarenes*, was one of the earliest gospel-books. It was probably a secondary form of the Aramaic original of our canonical Greek Matthew, written perhaps as early as 100 A.D. for the use of the Aramaic-speaking Christians of Palestine and Syria. The later Jewish-Christian sect of the Ebionites had a gospel called *The Gospel of the Twelve*, written in Greek, probably not earlier than 200 A.D. *A Gospel of the Egyptians* was in existence in the latter half of the second century. It was probably used in the country districts of Egypt. 4. Other gospels claimed apostolic authorship. The most important of these is the *Gospel of Peter*. Serapion, Bishop of Antioch, 190-211 A.D., discovered that this work was in use among the Christians of his diocese. Its use was neither approved nor severely condemned by the orthodox Bishop. A large fragment of this gospel was discovered in Egypt in 1885 and published in 1892. Though written early, certainly in the second century, it seems never to have been used as an authoritative gospel in the regular Church service. *A Gospel or Traditions of Matthias* (another name for Zacchæus, the publican), was known to Origen. This, with a *Gospel of Philip*, was used by Egyptian Gnostics. Other gospels of similar character were circulated under the names of Andrew, Barnabas, and Bartholomew. 5. Other forms of gospel material were in circulation in early times. Sayings of Jesus not contained in any known treatise are met with occasionally, such as the very interesting collections of Logia discovered at Oxyrrhynchus in Egypt. (See AGRAPHIA.) 6. In addition to the above there were gospels of an avowedly heretical type. Of these, the *Gospel of Basilides*, written by the famous Gnostic for the use of his disciples, and *Marcion's Gospel*, which appears to have been a form of our Gospel of Luke, were the most important.

(b) Apocryphal acts of apostles. The beginning of this literature is traditionally connected with the name of Leucius Charinus. Whether he is an historic personage is gravely doubted by many scholars. He is accredited with having composed the *Acts or Travels* (Περίοδοι) of the Apostles Peter, John, Thomas, Andrew, and Paul (each apostle treated separately). In these *Acts* certain Gnostic tendencies were manifest, such as a mystic doctrine of the Cross and those ascetic teachings that exalt celibacy as a form of higher life. Later works of like character were the *Acts of Matthew*, of *Bartholomew*, and of *Philip*. On this originally Gnostic basis, by expurgation or abbreviation of objectionable material, or by rewriting, yet using the same outlines, a series of Catholic Acts was produced, written from a more orthodox standpoint. A secondary form of the same literature is the so-called Abdias collection of *Martyrdoms* (*Passiones* and *Virtutes*) of the several apostles

and their companions (sixth century). The most important and extensive of these Acts are *The Acts of John* and *The Acts of Judas Thomas*, the Apostle to the Indians.

(c) Of apocryphal epistles, the most famous is the *Correspondence between Abgar, King of Edessa, and Jesus*. Apocryphal Pauline epistles were: 1. An *Epistle to the Laodiceans*, on the basis of the hint in Col. iv. 16. 2. An *Epistle to the Alexandrians* mentioned as early as c.170 A.D. 3. A *Third Epistle to the Corinthians*. These are imitations of the Pauline letters in the New Testament. 4. *Correspondence between Seneca and Paul* in 14 letters (at least as early as the fourth century).

(d) Apocryphal apocalypses. Of these *The Apocalypse of Peter* is the most important, a small fragment of which was discovered with the fragment of the *Gospel of Peter*. The work was in existence as early as 175 A.D. and highly esteemed in some quarters. To this class belong also the *Vision of Hermas* and the *Christian Sibylline Oracles* (q.v.). *The Apocalypse of Paul*, *The Vision of Paul*, *The Apocalypse of the Virgin Mary* and other like works are late and less important.

(e) Didactic works. *The Preaching* (κήρυγμα) of Peter was written very early, possibly before 100 A.D. It was perhaps also known as the *Didascalia* or *Doctrine of Peter*.

(f) Hymns. The discovery in 1909 by J. Rendel Harris of the *Odes of Solomon* has given us the only large collection of early Christian hymns. In the Syriac text Odes iii-xlii have been preserved. They were probably written in Greek, somewhere in northern Syria, in the second century A.D. (See SOLOMON, ODES OF.) For other works sometimes classed as New Testament apocrypha, see APOSTOLIC FATHERS; CLEMENTINA; BARNABAS, ACTS AND EPISTLE OF; HERMAS, SHEPHERD OF; TEACHING OF THE TWELVE APOSTLES.

Bibliography. For the apocrypha of the English Bible see the literature quoted in connection with each book and under Deuterocanonical Books. There are approximately complete translations of the Old Testament apocrypha in Kautzsch, *Die Apokryphen und Pseudepigraphen des alten Testaments* (Tübingen, 1900), and Charles, *The Apocrypha and Pseudepigrapha of the Old Testament* (Oxford, 1913). See also G. F. Moore, article "Apocrypha" in *Jewish Encyclopædia*; Churtow, *Uncanonical and Apocryphal Scriptures* (1884), *The Uncanonical Writings of the Old Testament Found in the Armenian MSS. of the Library of St. Lazarus*, translated into English by Jacques Issaverdens (Venice, 1901). The texts of the New Testament apocrypha have been published by Tischendorf, *Evangelia Apocrypha* (Leipzig, 1854), *Acta Apostolorum Apocrypha* (Leipzig, 1851), and *Apocalypses Apocryphæ* (Leipzig, 1866); R. A. Lipsius and Bonnet, *Acta Apostolorum Apocrypha* (Leipzig, 1883); Zahn, *Acta Johannis* (Erlangen, 1880); A. Hilgenfeld, *Novum Testamentum extra Canonem Receptum* (Leipzig, 1884); and *Evangeliorum (et ceterorum) quæ supersunt* (a collection of fragments), *Editio altera*. They have been translated into English by Walker in *The Ante-Nicene Christian Library*; and Pick, *Paralipomena* (1908); *Apocryphal Acts* (1909). Discussions: The most extended are R. A. Lipsius, *Die apokryphen Apostelgeschichten* (Brunswick, 1883-90), and Zahn, *Geschichte des neutesta-*

mentlichen Kanons (2d ed., Leipzig and Erlangen, 1889). For further literature, consult Krüger, *History of Early Christian Literature* (New York, 1897); Bardenhewer, *Geschichte der altchristlichen Literatur* (1902); Reid, article "Apocrypha" in *Catholic Encyclopædia*.

AP'OCYNA'CEÆ (Gk. ἀπό, apo, away from + κύων, kyōn, dog). The DOGBANE FAMILY. A family of dicotyledonous plants, the species of which are herbs, shrubs, vines, and trees, mostly with a copious, milky juice. The leaves are mostly opposite, entire, and without stipules. The flowers are five-parted; ovary single. Fruit, a follicle or drupe; seed often covered with a thistle-like down. There are about 130 genera and more than 1000 species in this family, the principal subdivisions of which are: ARDUINEÆ, represented by *Arduina* and *Landolphia*; PLUMBERIEÆ, containing the tropical genus *Tubernæmontana*, and *Aspidiosperma*, *Vinea*, and *Alstonia*; and ECHITIDEÆ, which embraces *Kickxia*, *Apocynum*, *Nerium*, and *Strophanthus*. The properties of plants of this family vary greatly, but many are exceedingly poisonous. Some, like *Kickxia* and *Landolphia*, are rich in caoutchouc; *Apocynum* yields valuable bast fibre, and its rhizomes are used in medicine; *Strophanthus* contains in its seed a powerful poisonous alkaloid; while others have varied economic uses. See PERIWINKLE; OLEANDER; INDIAN HEMP; RUBBER; STROPHANTHUS; DOGBANE; WRIGHTIA; POISONOUS PLANTS; ETC.

APOCYNUM, ā-pōs'ī-nūm. A genus of plants. See DOGBANE.

APOCYNUM, ā-pōs'ī-nūm. A drug composed of the powdered root of *Apocynum cannabinum*, Canadian hemp. Its taste is acrid and bitter. It contains a bitter principle, apocynine, gallic and tannic acids, etc. Its active ingredients are soluble in water and alcohol. Moderate doses increase the secretions of the skin, bronchi, and kidneys. Large doses cause vomiting and purging. The chief use of apocynum is as a diuretic, especially in dropsy. See APOCYNACEÆ; DOGBANE.

APODES, āp'ō-dēz (Gk. ἀ, a, priv. + πούς, pous, foot). An order of teleost fishes, variously limited, including the eels (not the electric eel), murenas, and allied serpentiform species. Consult T. Gill, *Standard Natural History*, vol. iii, p. 100 (Boston, 1885) and Jordan, *Fishes*, p. 364 (New York, 1907). See EEL.

AP'ODIC'TIC (Gk. ἀποδεικτικός, apodiktikos, demonstrating, -ive). A logical term signifying necessary, and applied to judgments, which admit of no contradiction. It is used largely by Kant. See A PRIORI.

APOG'AMY (Gk. ἀπό, apo, away from + γάμος, gamos, a wedding). A name which refers to the fact that a plant which ordinarily comes from a fertilized egg may, under certain conditions, develop in some other way. In all plants, except the very lowest, there are two plants in each life-cycle: a sexual plant and a sexless one, each producing the other. (See ALTERNATION OF GENERATIONS.) Apogamy is a general term, used to cover all cases in which the sexless plant does not come from a fertilized egg, without reference to the method of its origin. "Parthenogenesis" is that form of apogamy in which a plant is developed from an egg that has not been fertilized. In other cases of apogamy the new plant is developed in a vegetative way from various other tissues, such an origin being distinguished as "vegetative

apogamy." The phenomenon of apogamy has been observed chiefly among the ferns, which seem to respond most readily to the conditions which favor it. Numerous cases have now been observed (both among native and cultivated forms), in which the leafy plant (sexless) arises in various ways directly from the prothallium (sexual), without the fertilization or even the production of an egg. Among the mosses apogamy has never been observed; that is, there is no reason to believe that the spore-bearing structure (sexless plant) ever has any other origin than a fertilized egg. Among the seed-plants the phenomenon has been recorded in a number of cases, and has often been wrongly referred to parthenogenesis. So far as the records go, parthenogenesis has been established in comparatively few seed-plants. In various other cases, however, in which embryos are known to arise in seeds which have received nothing from the pollen, it is discovered that the embryo is not developed by the unfertilized egg, but arises vegetatively from various tissues of the ovule, just as a bud may develop almost anywhere upon a plant. The fact that a seed contains an embryo is no sure indication that this embryo has developed from the egg.

AP'OGEE (Gk. *ἀπό*, *apo*, from + *γῆ*, *gē*, earth). When the earth and some other planet reach such positions in their respective orbits that the distance between them is a maximum, then that planet is said to be in its apogee. The use of the word "apogee" is usually restricted to the sun and moon, the sun's apogee corresponding to the earth's aphelion, and the moon's apogee being the point of its orbit most remote from the earth. Apogee is opposed to perigee.

AP'OGEO'T'ROPISM, or **NEGATIVE GEOTROPISM**. That form of sensitiveness to gravity in plants by virtue of which organs tend to grow vertically upward—that is, in a direction opposite to that of the earth's attraction. The best example of this phenomenon is found in the main shoots of most plants. When "centrifugal force" is brought to bear upon the plant in place of gravity, the stems of seedlings grow toward the centre of revolution, while the roots being positively geotropic, grow in the opposite direction. See **GEOTROPISM IN PLANTS**.

APOLDA, *à-pōl'dà*. A town of the grand duchy of Saxe-Weimar, Germany, near the Ilm, a feeder of the Saale, 8 miles northeast of Weimar (Map: Germany, D 3). It is a station on the Thuringian Railway, between Weimar and Weissenfels, and a place of much industrial activity, having extensive manufactures of hosiery and woven goods, boilers and engines, and bell foundries. Pop., 1895, 20,798; 1900, 20,352; 1905, 21,262; 1910, 22,592.

AP'OLIS'TA. A small tribe of Indians, whose language constitutes them a distinct linguistic stock, originally inhabiting the valley of the Apolo (whence the name), an affluent of the Rio Beni, in northern Bolivia, northeast of Lake Titicaca. They now live just north of the Lecos. Consult the writings of Armentia, Ballivian, Cardús, etc. De Créqui Montfort and Rinet, in a monograph on the Apolista or Lapaçu language in *Zeitschrift für Ethnologie*, vol. xlv, pp. 512-531 (1913) seek to prove it "a moribund Arawak dialect."

APOL'LINA'RIS (?-392). The younger, Bishop of Laodicea in Syria, and one of the warmest opponents of Arianism. Both as a man

and a scholar he was held in the greatest reverence, and his writings were extensively read in his own day. His father, Apollinaris the elder, who was Bishop of Laodicea, was born at Alexandria, and taught grammar, first at Berytus, and afterward at Laodicea. When Julian prohibited the Christians from teaching the classics, the father and son endeavored to supply the loss by converting the Scriptures into a body of poetry, rhetoric, and philosophy. The Old Testament was selected as the subject for poetical compositions after the manner of Homer, Pindar, and the tragedians; while the New Testament formed the groundwork of dialogues in imitation of Plato. But it was chiefly as a controversial theologian, and as the founder of a sect, that Apollinaris is celebrated. He maintained that the *logos*, or divine nature in Christ, took the place of the rational human soul or mind, and that the body of Christ was a spiritualized and glorified form of humanity. This doctrine was condemned by several synods, especially by the Council of Constantinople (381), on the ground that it denied the true human nature of Christ. The heresy styled Apollinarianism spread rapidly through Syria and neighboring countries, and, after the death of Apollinaris, its adherents formed two sects—the Vitalians, named after Vitalis, Bishop of Antioch, and the Polemeans, after Polemo, who added to the doctrine of Apollinaris the assertion that the divine and human natures were so blended as one substance in Christ that his body was a proper object of adoration. On this account they were accused of *sarcolatria* (worship of the flesh) and *anthropolatria* (worship of man) and also were styled *synousiastoi* (*σύν, syn*, together, *οὐσία, ousia*, substance), because they confused the two distinct substances. Other leaders were Valentinus and Timothy. Consult Harnack, *History of Dogma*, vols. iii, iv.

APOLLINARIS, SAINT. A citizen of Antioch, founder and bishop of the church of Ravenna. He was said to have followed St. Peter to Rome, where he was ordained. Tradition says he was martyred in Ravenna, after being bishop of that place for 26 years.

APOLLINARIS, SULPICIUS. See **SULPICIUS APOLLINARIS**.

APOLLINARIS SIDO'NIUS, CAIUS SOLILIUS (c.430-487 or 488). A Roman author, political leader, and Bishop of Arverna (Clermont-Ferrand), born at Lyons. He married in about 452 the daughter of Avitus, who was Emperor from 455 to 456. He was Prefect of Rome in 467, bishop in 472, and headed the national party against the Goths. In 474 he was imprisoned, but was later released and ruled his bishopric until his death. After his death he was canonized. He wrote nine books of letters of great historical value, and 24 poems, mainly panegyric. The best edition of his work is in the *Auctorum Antiquissimorum*, vol. viii, in the *Monumenta Germaniæ Historica* (Berlin, 1887). Consult Hodgkin, *Italy and her Invaders*, vol. ii (Oxford, 1892), and Dill, *Roman Society in the Last Century of the Empire* (London, 1898).

APOLLINARIS WA'TER. An alkaline mineral water obtained from a spring in the valley of the Ahr, in Rhenish Prussia, which was discovered in 1851. Its pleasant taste and richness in carbon dioxide gas make it a valuable table water, recommended for dyspepsia and loss of appetite.

Its composition is:

Sodium carbonate	6.964	grains in a pint
Magnesium "	2.751	" "
Calcium "	1.900	" "
Sodium chloride	2.743	" "
Sodium sulphate	1.548	" "
Sodium phosphate }	Traces.	
Potassium salts }		
Iron oxide with alumina	0.049	" "
Silicic acid	0.099	" "
Carbonic acid (free and semi-combined)	42.81	cub. in. in a pint
Carbonic acid (combined)	12.44	" "

APOLLO. A borough in Armstrong Co., Pa., 25 miles (direct) northeast of Pittsburgh, on the Pennsylvania Railroad and on the Kiskiminetas River (Map: Pennsylvania, B 6). It is the centre of a coal-mining region and manufactures steel, lime, and woolen goods. Apollo was settled in 1790, laid out in 1816, and incorporated as a borough in 1848. Pop., 1890, 2156; 1900, 2924; 1910, 3006.

APOLLO (Gk. Ἀπόλλων, *Apollōn*, Doric for Ἀπέλλων, *Apellōn*). Next to Zeus, the most important and most widely worshiped divinity of Greece. Later antiquity identified Apollo with the sun, but in Homer the two are entirely distinct. As to the origin and the meaning of the name Apollo, there is no general agreement among scholars, though the weight of argument is slightly in favor of those who interpret it as 'he who wards off,' 'he who drives away' evil, from which conception it is easy to explain many of the varied forms of the Apollo cult. Thus Apollo is a god who heals diseases and purifies from moral defilement. So he was said to have purified Orestes (q.v.) for the murder of his mother, and so he was invoked to purify and cleanse entire communities afflicted by pestilence. In the same way his protection was extended to flocks and herds, as is shown by his epithet *Nomios*, and by the story of his serving as the shepherd of Admetus (q.v.), to the great increase of the flocks of that king. He also appears as protecting the grain from mildew, and as driving away field-mice, whence his surname *Smintheus*; as Apollo *Parnopios* he kept off the locusts (*πάρνοπες*). There are also traces of Apollo as a war god, who can drive away the enemy and who mingles actively in the fray; at the shrine in Amyclæ (q.v.), near Sparta, he appeared with a helmet and a lance. Nor is this view of the original conception of Apollo in any way inconsistent with his very obvious connection with the light. For that he was early connected with the sun is clear, from the celebration of his departure in the autumn to a distant land, and his return in the spring. Light is regarded as a healer and protector, the bane of evil spirits who love darkness. The light and heat, however, are not always beneficent, and Apollo thus appears as the sender of pestilence and as bringing sudden death with his unerring arrows. As a light-god, also, he is called *Lycean* and *Lycian*; these terms may be connected with the Latin *lux*, 'light.' The ancients connected them with the Greek word for 'wolf' (*λύκος*, *lykos*), and some good modern authorities consider Apollo as originally a herdsman's divinity in the form of a wolf. In a kindred view "Apollo was one outgrowth of the shepherd-god existing in each community, himself once a shepherd, protecting the sheep from wolves, patron of the music and the games that shepherds love." He is also styled *Phœbus* (*Φοῖβος*), the 'bright one,' the 'brilliant one.' Whatever may have been his early nature, the

prominent conception of Apollo in historic times was as a god of prophecy and so of music and song. His most famous oracle was at Delphi (q.v.), but there were others at Delos; at the Ismenian sanctuary near Thebes; at Abæ, on the border of Phocis; at Patara, in Lycia; and at Claros, in Ionia, near Colophon. Apollo was also a god of colonization, and many Greek cities believed that their founders had been guided by Apollo in the form of an animal or bird.

As is natural in the case of a god so widely worshiped, the legends of Apollo are highly diversified, though the main features show considerable unity, due to the overpowering influence of the cults at Delphi and Delos, which made their versions canonical. He was the son of Zeus and Leto (Latona), born with his twin sister Artemis (see *DIANA*) on the island of Delos, which had hitherto floated on the sea, but now became fixed, and afforded a refuge for Leto, who had been driven from all other places by the wrath of Hera (see *JUNO*). After his birth the god hastened to Delphi and slew the dragon Python, who had pursued his mother during her sorrow. For other legends see *ADMETUS*; *HYPERBOREANS*; *LAOMEDON*; *NIOBE*. In Greece Apollo was not the god of any single race. The Ionians worshiped him as the ancestral god, *Patroös*; the great Dorian festival, *Carneia* (see *GREEK FESTIVALS*), was held in his honor. At Athens, at the *Thargelia*, in May, first fruits were offered to him, there were musical contests in his honor, and the city was purified by special rites that the ripened grain might escape his wrath. In Rome his worship was introduced from Greece at a comparatively late date. The earliest mention of a place of worship for Apollo is in 443 B.C., and it was not till 212 B.C. that the *Ludi Apollinares* were celebrated. Augustus greatly increased the honor of the god in gratitude for the victory of Actium (q.v.) (for Apollo's help of Augustus at Actium see Vergil, *Æneid*, viii, 704 ff.), and built him a splendid temple on the Palatine, with which a library was connected. The temple contained the celebrated statue of the god by Scopas.

The representations of Apollo in ancient art are almost innumerable. As Apollo *Agyieus*, or Apollo of the Streets, he was worshiped in the form of a conical stone. In general, two chief types can be distinguished. In the one Apollo appears as a nude youth, the ideal of youthful strength and beauty. This can be traced from the rude statues of archaic art, of Melos, Thera, and Orchomenus, through the Payne-Knight bronze, and the Choiseul-Gouffier marble in the British Museum, to the almost effeminate type of the Apollo *Sauroctonos* (the lizard-slayer) of Praxiteles, or the glorious divinity of the Apollo of the altar frieze from Pergamon (q.v.). The other type represents the god as clad in the long robe of the musician playing on the lyre, as he appears in the statue in the Vatican (see *APOLLO BELVEDERE*), which is probably a copy of the work of Scopas. The special attributes of Apollo are the bow and the quiver, the laurel and the lyre. Consult: Overbeck, *Griechische Kunstmythologie* (Leipzig, 1871-89); Wernicke in the Pauly-Wissowa *Realencyklopädie der klassischen Altertumswissenschaft* (Stuttgart, 1900); Farnell, *The Cults of the Greek States* (Oxford, 1896-1907).

APOLLO BELVEDERE, bĕl'vâ-dâ'râ. A celebrated statue of antiquity, probably found

at Grotto Ferrata (less probably at Porto d'Anzio: see ANTIUM), and in 1503 placed in the Belvedere of the Vatican by Pope Julius II. The left hand and right forearm were restored by Montorsoli, a pupil of Michelangelo. The ægis (q.v.), which has been restored in the left hand, on the evidence of a bronze statuette, supposed to have been found in 1792, and now in St. Petersburg, is not known as an attribute of Apollo, nor is its presence in the statuette proved; further, the statuette has been pronounced by Furtwaengler (q.v.) a modern forgery. The significance of the statue cannot be surely determined. In one view the beautiful face expresses divine wrath and contempt. The god, clad only in the chlamys (q.v.), is moving forward against the powers of evil to rescue the distressed. Furtwaengler rejected this view and maintained that the right hand originally held a laurel branch wound with fillets, and that the presence of the quiver shows that the left raised the bow. The bow, he continued, marked Apollo as the "Far-Darter"; the laurel and the fillets referred to the propitiatory and cleansing power of Apollo. Thus the statue emphasizes two views of Apollo. This statue was once regarded as the highest type of Greek art, but it has long been known to be only a careful Roman copy, made about the beginning of the Empire, of a Greek original, which cannot well be earlier than the latter part of the fourth century B.C. (possibly by Leochares), while many good authorities regard it as belonging to the third, or even second century. Consult W. Helbig, *Guide to the Public Collections of Classical Antiquities in Rome* (a translation of a German work, by J. F. and Finlay Muirhead, Leipzig, 1895); A. Furtwaengler, *Masterpieces of Greek Sculpture*, a translation by Eugenie Sellers (London, 1895).

APOLLO CITH'ARÆ'DUS (Gk. *κιθαρωδός*, *kitharōdos*, harper, from *κιθάρα*, *kithara*, lyre + *αοιδός*, *aoidos*, singer). Apollo, in his function of God of Music. Two famous statues of him in this capacity are in existence: one at the Vatican, the other at the Glyptothek in Munich, both of uncertain date and origin.

APOLLO CLUB. A seventeenth-century literary *coterie*, resembling the Elizabethans' "Areopagus," or that still more famous gathering which, in the eighteenth century, surrounded Dr. Johnson. Among its members were Ben Jonson, Robert Herrick, Randolph, and other poets and pamphleteers. Its meeting place was the Devil Tavern at Temple Bar.

AP'OLLODO'RUS (Gk. *'Απολλόδορος*, *Apollōdōros*). 1. An Athenian painter of the fifth century B.C., an elder contemporary of Zcuxis. He is said to have introduced the rendering of light and shade in place of the flat coloring of his predecessors. 2. A celebrated architect of the early part of the second century A.D., employed by the Emperor Trajan in the construction of his splendid stone bridge over the Danube, in the building of the Forum called the Forum of Trajan, and other works in Rome. His severe censure of Emperor Hadrian's architectural plans is said to have caused Apollodorus's banishment and death. 3. A Greek grammarian of the second century B.C. He studied philosophy in his native Athens and then joined the Alexandrian scholars about Aristarchus; he wrote a chronicle in iambic verse and several grammatical works. His greatest work was *On the Gods*, apparently a history of the Greek religion, though its exact

nature can only be conjectured from scattered notices. The extant mythographical handbook which begins with the origin of the gods, and ends with the story of Troy, and which is of great value, is certainly, though it bears the name of Apollodorus, a compilation of a later date.

AP'OLLO'NIA (Gk. *'Απολλωνία*). The name of more than 30 ancient cities. 1. In Illyria, on the Aoüs, founded by emigrants from Corinth and Coreyra, commercially prosperous, and toward the end of the Roman Empire a seat of literature and philosophy. 2. In Thracia (afterward Sozopolis, and now Sizeboli), colonized by Milesians, and famous for a colossal statue of Apollo, by Calamis, which was removed to Rome by Lucullus (q.v.). 3. The port of Cyrene (afterward Sozusa, and now Marsa Suza), which outgrew Cyrene itself and left evidences of its magnificence in the ruins of its public buildings. Eratosthenes (q.v.) was born there. 4. A city of Macedonia, referred to in Acts xvii. 1, as one of the stations on the road from Amphipolis to Thessalonica. Its exact position is not known. It was, doubtless, on the celebrated Via Egnatia, probably near the present Gol (Lake) Beshik, to the south. Little is known of its history.

AP'OLLO'NIUS (Gk. *'Απολλώνιος*, *Apollōnios*). An Alexandrian scholar, son of Archibius. He lived toward the end of the first century A.D. and compiled a lexicon of Homeric words, the main sources of which were Apion's *Glossary* (see APION), and the commentaries of Aristarchus and Heliodorus. Though it has come down to us in abridged and otherwise imperfect form, this work is valuable for the exegetical study of Homer.

APOLLONIUS, OF PERGA. A mathematician, younger contemporary of Archimedes and Eratosthenes. Born at Perga, in Pamphylia, he lived, during the years of his activity as a scholar, which were approximately from 247 to 205 B.C., at Alexandria and Pergamum. His principal work was a treatise on Conic Sections, in eight books, the first four of which, accompanied by a sixth-century commentary on them by Eutocius, have come down to us in the original Greek. The extant books give the elements of the subject as an introduction to the more advanced theory. Apollonius clearly indicates his indebtedness to earlier scholars: at the same time it is plain that much of his work was original. Books i-vii were twice translated into Arabic in the ninth and tenth centuries; copies of these translations have been known in Europe since the seventeenth century; from one of these Arabic translations a Latin translation of books v-vii was made by Abraham von Echelles and Alfonso Borelli, and published at Florence in 1661. Of book viii there exist only certain *lemmata* of Pappus (q.v.) dating from the third and fourth centuries A.D. Apollonius's work, containing 400 problems, was so complete that it left little for his successors to improve. He wrote on the methods of arithmetical calculation, on statics, the stations and regressions of the planets (a work upon which Ptolemy drew in writing the *Almagest*), and on transversals of conics, which laid the foundation for the geometry of position. Among his other works deserving mention are: *De Sectione Spatrii*, *De Sectione Determinata*, and *De Tractionibus*. Apollonius's problem, "To draw a circle tangent to three given circles in a plane," found in his



APOLLO BELVEDERE
IN THE BELVEDERE OF THE VATICAN

treatise on *Contact*, has been solved by Newton, Vieta, and others. Consult: Halley, *Opera et Studia* (Oxford, 1710), which is the best edition of the extant works of Apollonius; Heiberg, *Apollonii Pergaei quae Graece Exstant Opera* (Leipzig, 1891-93); H. G. Zeuthen, *Die Lehre von den Kegelsehnitten im Altertum* (Copenhagen, 1886). T. L. Heath's Cambridge edition also deserves mention.

APOLLONIUS, OF TRALLES. See AMPHION.

APOLLONIUS, OF TYANA. A native of Tyana, in Cappadocia, who lived in the time of Christ. He was a zealous follower of the doctrines of Pythagoras. He traveled through Asia to Nineveh and Babylon, thence to India, where, at the court of King Phraortes, he met Jarchas, the principal Brahmin. When Apollonius returned from this pilgrimage, his fame as a wise man was greatly increased; the people regarded him as a worker of miracles and a divine being, and princes were glad to entertain him at their courts. He himself seems to have claimed insight into futurity rather than the power of working miracles. Yet in Rome it was claimed that he raised a young woman from the dead. He was acquitted of treason by Nero, because the indictment had vanished from the paper. After extensive travels in Spain, Italy, Greece, and Ethiopia, he was accused of having taken part in an insurrection against Domitian. He appeared before the tribunal, but soon miraculously vanished. Ultimately he appears to have settled in Ephesus, where he opened a Pythagorean school and continued his teaching until he died, nearly 100 years old. His history was written by Philostratus (q.v.), but is plainly a religious novel intended for the entertainment of Julia, wife of the Emperor Severus. The travels of the apostle Paul are a more likely inspiration to this work than the Gospel narrative of Christ. It contains a mass of absurdities and fables through which an outline of historical facts and the real character of the man are sufficiently discernible. Hierocles, a heathen statesman and opponent of Christianity, wrote, in the third century, a work on the life and doctrines of Apollonius, with a view to prove their superiority to the doctrine of Christ. In modern times Blount in England and Voltaire in France have renewed the attempt. Consult: B. L. Gildersleeve, *Essays and Studies* (New York, 1890), and L. Dyer, *Studies of the Gods in Greece* (New York, 1894); and for his life, Philostratus in the Teubner series, vol. i (Leipzig, 1870-71); Eng. trans., Guthrie (New York, 1905); Fr. trans., A. Chassang (Paris, 1862); Ger. trans., E. Baltzer (Rudolstadt, 1883); also the essay of F. C. Baur, "Apollonius von Tyana und Christus," in *Drei Abhandlungen* (ed. Zeller, Leipzig, 1876); O. de B. Prieulx, *The Indian Travels of Apollonius of Tyana* (London, 1873); D. M. Tredwell, *A Sketch of the Life of Apollonius of Tyana* (New York, 1886); G. R. S. Mead, *Apollonius of Tyana* (London, 1901); Campbell, *Apollonius of Tyana* (New York, 1909).

APOLLONIUS, OF TYRE. The hero of a Greek romance now lost, which in a Latin version enjoyed great popularity in the Middle Ages and was translated into almost all the languages of western Europe (the earliest translation seems to have been one into Anglo-Saxon, in the ninth or the tenth century). In it are related the romantic adventures which be-

fell Apollonius, a Syrian prince, previous to his marriage with the daughter of King Alcistrates, of Cyrene. To these are added the adventures of his wife, who was parted from him by apparent death, as well as those of his daughter, Tarsia, who was carried off by pirates and sold in Mytilene. The work closes with the reunion of the whole family. The original Greek work, which was soon lost, belonged to the third century A.D. and showed close relations with the *Ephesiaea* of Xenophon of Ephesus. The Latin version was made by a Christian, not earlier than the fifth century. The account given in the *Gesta Romanorum* and the part contained in the *Pantheon* of Godfrey of Viterbo (c.1185) are drawn from this early translation. The earliest translation from the Latin was into Anglo-Saxon in the ninth or the tenth century; an early English rhymed version of the end of the fourteenth century is to be found in Gower's *Confessio Amantis*; and the materials are employed in Shakespeare's *Pericles, Prince of Tyre*. About 1300 Heinrich von der Neuenstadt produced a poetical version in over 20,000 verses, based probably on the account in the *Gesta Romanorum*. The *Histori des Küniges Apollonii*, published 1476, is translated from Godfrey of Viterbo, as is the Spanish version of the thirteenth century, printed in Sanchez's *Colección de Poesias Castellanas* (Paris, 1842). Several French and Italian versions have been made from the same source. There are also middle and modern Greek versions extant. The Latin translation, which survives in about 100 manuscripts, from the Greek original, has been edited by Riese, *Historia Apollonii Regis Tyri* (2d ed., Leipzig, 1893). Consult in general: the preface to Riese's edition; Rohde, *Der griechische Roman und seine Vorläufer* (Leipzig, 1900); Hagen, *Der Roman vom König Apollonius in seinen verschiedenen Bearbeitungen* (Berlin, 1878); Krumbacher, *Byzantinischer Litteraturgeschichte*, p. 434; M. Haupt, *Opuscula*, vol. iii; Simrock, *Quellen des Shakespeare* (Bonn, 1872).

APOLLONIUS DYS'COLUS (Gk. Ἀπολλώνιος Δύσκολος, *Apollōnios Dyskolos*). An Alexandrian scholar who lived in the first half of the second century A.D. He and his son, Herodian, were the greatest Greek grammarians. Apollonius reduced grammar to a system and made a science of syntax. He wrote a large number of works, but the greater portion of them perished early. Four are extant: those on *Pronouns*, on *Conjunctions*, on *Adverbs*, and on the *Syntax of the Parts of Speech*. It is not clear whether the surname *Dyscolus* ('crabbed') had reference to his literary style or to his disposition of mind. Priscian (q.v.) founded his great work on Latin grammar on the work of Apollonius. Consult J. E. Sandys, *A History of Classical Scholarship*, vol. i, pp. 319 ff. (Cambridge, 1906).

APOLLONIUS MO'LON. A Greek rhetorician, born at Alabanda, in Caria. He taught rhetoric at Rhodes and was a distinguished pleader in the courts. In 81 B.C., having been sent to Rome as an ambassador by the Rhodians, he addressed the Roman Senate in Greek. He stayed some time at Rome and was there heard by Cicero, who afterward (78 B.C.) studied under him at Rhodes. Other distinguished Romans, among them Cæsar, also attended his lectures.

APOLLONIUS RHO'DIUS (c.295-c.215 B.C.).

An epic poet, son of Silleus (or Illeus), born at Alexandria. As a youth he was the pupil of Callimachus (q.v.), but afterward entered into a bitter strife with his former teacher, on literary grounds. Callimachus was the champion of the short poem in the artificial and learned style, while Apollonius preferred the lengthy poem in the simple style of Homer. The *Argonautica*, the most important and only extant poem of Apollonius, was in part written while the author was at Alexandria and was received with scorn by the audience there. Apollonius then withdrew to Rhodes, revised his poem, and produced it with great acclaim. He received citizenship at Rhodes, set up a school of rhetoric there, and styled himself the *Rhodian*. Later in life he is said to have returned to Alexandria and to have succeeded Eratosthenes as librarian—an office which he held till his death. The *Argonautica* is an epic poem in four books, containing an account of the expedition of the Argonauts in quest of the Golden Fleece. The first two books describe the departure of the expedition and the adventures on the way; the third book tells of the passion of Medea for Jason; the fourth book gives an account of the return home. The poem imitates the language and style of Homer, but it is labored and lacks spirit and movement, except in the third book, on which Vergil drew largely in writing the fourth book of the *Æneid*; in this book Apollonius shows himself master of the psychological analysis of human passion. The *Argonautica* was much admired by the Romans, being translated at least once, by Varro, of Atax, in Gaul, a contemporary of Horace, and often imitated by them. (See VALERIUS FLACCUS.) Apollonius wrote other works in verse and in prose. There are critical editions by Merkel (1854) and R. C. Seaton (Oxford); translations by A. S. Way (London) and Seaton (New York, 1912). There is an annotated edition in English, unfortunately not critical or accurate, by G. W. Mooney (London, 1912).

APOL'LOS (Gk. Ἀπολλῶς, an abbreviation of Ἀπολλώνιος, *Apollōnios*). An early Christian missionary and companion of St. Paul. He was an Alexandrian, converted probably in Alexandria by followers of John the Baptist, and at once threw himself with enthusiasm into the work of propagating the new faith. He came to Ephesus and there gladly accepted the fuller instruction which he received from Priscilla and Aquila. Thus equipped, he passed on to Corinth, where he labored with great success (Acts xviii. 24–28). But unhappily there were those there who made a party called by his name and so contributed to the factional troubles in the Corinthian church. From Corinth he went to Ephesus. But his Corinthian admirers, who preferred his more rhetorical manner of preaching to the simpler manner of Paul, desired his return, and he promised to come a little later (1 Cor. i. 10–12; iii. 4–6; xvi. 12). The last mention of him in the New Testament (Titus iii. 13) shows him about to undertake a journey to Crete. According to tradition he became the first Bishop of Crete.

APOLLO SAUROK'TONOS (Gk. Σαυρόκτονος, *Sauroktonos*, *Lizard-Killer*, from σαύρα, *lizard* + κτείνω, *to kill*). A statue of the youthful Apollo in the Vatican—a copy of a bronze of Praxiteles, which Pliny calls “the most beautiful bronze statue left in the world.” It represents the

god leaning against a tree, dart in hand, ready to slay a lizard as it runs up the trunk. In the Roman Campagna men and boys still amuse themselves throwing knives at lizards. The statue was found in 1777 in the Villa Magnani, on the Palatine. Consult Helbig, *Guide to the Public Collections of Classical Antiquities in Rome*, translated by James F. and Findlay Muirhead (Leipzig, 1895–96).

APOLLYON, à-pōl'li-on, or à-pōl'yūn (Gk. Ἀπολλύων, from ἀπολλύναι, *apollynai*, to destroy). A designation used (Rev. ix. 3–11) to translate the Hebrew *Abaddon*, which means ‘destruction,’ and which was one of the names given to the great gathering place of the dead, more commonly known as Sheol. Apollyon is personified as the angel having dominion over the locusts coming up out of the “bottomless pit” at the sound of the fifth trumpet on the day of judgment. In Talmudic literature (*Shabbath* 55a) Abaddon is the name given to the angel who with Maweth, i.e., ‘death,’ stands over the six angels of destruction, who aid God in the punishment of the wicked.

AP'OLO'GIA PRO VI'TA SU'A (Lat. defense of his life). John Henry (afterward Cardinal) Newman's defense of his position in the “Oxford Movement.” Its immediate cause was an accusation made by Charles Kingsley, that “Truth for its own sake has never been a virtue with the Roman clergy. Father Newman informs us that it need not and, on the whole, ought not to be.” Newman first demanded a substantiation or a retraction of this charge; and unable to obtain either, published the *Apologia*.

APOL'OGIE FOR PO'ETRY. A famous work written by Sir Philip Sidney in 1580, and published in 1595, in answer to an attack on the playhouses entitled *The School of Abuse*, dedicated to him without his consent, by Stephen Gosson. It is a defense and eulogy of the art of poetry, closely modeled after Aristotle's *Poetics* and couched in the exaggerated Elizabethan style.

AP'OLOGUE (Gk. ἀπόλογος, *apologos*). A fable or short story, with animals or inanimate objects as actors or speakers, intended to convey some moral. The true apologue differs, however, from both the fable and the parable—from the former in that it always carries a moral, and from the latter in not being realistic. The apologue, though dramatic, cannot reach such artistic heights as the parable, since the points of resemblance between the animal and the man are too few and the analogies too crude. Unlike the parable, which aims to bring out man's relations to God, the apologue falls far short of portraying human character; it parodies rather than depicts human nature. Its origin is very ancient and its historical development very uncertain. It was first conceived in the East, where this form of tale served the purpose of voicing the slaves' protest against oppression. Both Æsop and Phædrus, the accredited fathers of the apologue, were slaves. Others after them have so much translated, amended, and edited their fables that it baffles the specialist to trace their history. Some of those who have imitated these earlier fables most successfully were La Fontaine in France, Lessing in Germany, and Kryl'ov in Russia. That collection, however, which is known as *Æsop's Fables* still enjoys the greatest reputation throughout the world. For an account of

the fable, consult Jacobs, Introduction to *The Fables of Æsop* (New York, 1896).

APOL'OGY (Gk. ἀπολογία, *apologia*, a speech in defense, defense). A term now commonly understood as synonymous with an excuse for breach of an engagement, etc., but originally used as the title of any work written in defense of certain doctrines, as in the *Apology of Soerates*, ascribed to Plato and Xenophon; the *Apology for the Christians*, by Tertullian, and in many other defenses of the Christians, written by Justin Martyr, Aristides, Athenagoras, Tatian, Theophilus, Origen, Eusebius, Minucius Felix, Arnobius, Lactantius, Augustine, Orosius, and others. After the fourth century, when the Church was made dominant under the Roman emperors, apologetical writings were less called for; but Bartholus Edessenus and Raymundus Martinus wrote against the Jews and the Mohammedans. In the fifteenth century, when the revival of learning placed Christianity in apparent opposition to the Platonic philosophy, Marsilius Ficinus wrote in defense of revelation; and, some time after the Reformation, the spread of free-thinking and skepticism in England was opposed by a variety of apologetical works, chiefly maintaining the points that Christianity is a divine revelation, Christ a divine Messenger, and His Church a divine institution. The defense of Christianity on grounds of reason came now to be treated as a distinct branch of theology, under the name of *Apologetics*. Among the numerous apologetic works by Protestants may be mentioned those by Grotius (*De Veritate*, etc.), Butler (*Analogy of Religion, Natural and Revealed*), Lardner (*Credibility of the Gospel History*), Leland, Addison, Soame Jenyns (*Internal Evidences of the Christian Religion*), Hugh Farmer, Bishop Watson (*Apology for Christianity*), Paley (*Evidences of Christianity and Horæ Pauline*). Among Roman Catholic apologetic writers the most eminent are Pascal, Hauteville, Guenée, Bergier, Mayr, and Chateaubriand.

In the nineteenth century a great number of apologetic works by Neander, Tholuck, and others were called forth in reply to Strauss's *Das Leben Jesu* and the *Vie de Jésus* by Renan. Later came the attacks from agnostic, materialistic, and other philosopho-scientific sources, and these have been replied to by Christian scholars, as A. Ebraid, *Apologetics* (2d ed., Gütersloh, 1878-80; Eng. trans., 3 vols., Edinburgh, 1886-87); P. Schanz (Catholic) (Freiburg, 1895-98; Eng. trans., 3 vols., Dublin, 1897); A. B. Bruce, *Apologetics* (New York, 1892). Manifestly these works are written to meet a passing need, and few of them retain much value after a few years.

AP'OMOR'PHINE (Gk. ἀπό, *apo*, away from + *morphine*). An artificial alkaloid made by heating morphine with hydrochloric acid under pressure. The salt of apomorphine employed in medicine is the hydrochloride, which occurs in minute, colorless crystals that acquire a greenish tint on exposure to light and air. It is the best known of the so-called systemic emetics (see **EMETIC**) and causes vomiting within 5 to 20 minutes, whether given by mouth or hypodermatically. This emesis is due to direct action on the vomiting centre in the medulla. It is repeated frequently, with little nausea, after the stomach has been emptied, and is accompanied by marked muscular relaxation. The respiration and circulation are also depressed, and

large doses may cause convulsions, followed by paralysis. As an emetic it is used when prompt action is desired or when swallowing is difficult or impossible. It is used also in small doses as a sedative expectorant. Furthermore, apomorphine has been recommended as a hypnotic and is said to act usually within 10 or 15 minutes. For this purpose a small dose is given hypodermatically after lying down.

AP'ONEURO'SIS (Gk. ἀπονεύρωσις, end of a muscle where it becomes tendon, from ἀπό, *apo*, away + νεῦρον, *neuron*, sinew, tendon). An anatomical term for a sheet-like expansion of strong fibrous tissue, of which there are many examples in the human body. For the sake of convenience, it is generally confined to expansions from the tendons of muscles, as the lumbar aponeurosis. If a tendon is very broad and expanded, as that of the external oblique muscle of the abdomen, it is said to be aponeurotic. Some muscles, as those on the shoulder-blade, are partially covered with a tendinous expansion, to which some of their fibres are attached; this is termed the aponeurotic origin of the muscle; it gives the muscle a more extensive attachment, without adding materially to its weight.

APOPHYGE, à-pŏf'ī-jē (Gk. ἀπό, *apo*, from + φεύγειν, to flee). In architecture, (1) a molding of concave, approximately quarter-round section, like an inverted cavetto, by which the shaft of a column or pilaster flares out to form the cincture at the top of the base. (See **COLUMN**; **ORDERS OF ARCHITECTURE**.) This flare is very pronounced in some early Greek Ionic orders, as in that of the temple of Apollo Epikourios at Bassæ. (2) The hollow molding or profile, almost a scotia, under the echinus of some early Greek Doric capitals in Magna Græcia (at Præstum, the Basilica and temple of Demeter, and a temple at Metapontium). It is loosely used also of the transition from shaft to echinus of any Greek Doric capital and of the slight flare under the astragal at the top of the shaft in all the Roman orders. The French word *congé* (= leave-taking, dismissal) is used by many in the same sense.

APOPH'YLLITE (Gk. ἀπό, *apo*, away + φύλλον, *phyllon*, leaf). A common mineral of the zeolite group. It is a hydrated potassium-calcium silicate crystallizing in tetragonal forms. The lustre is vitreous except on cleavages parallel to the basal pinacoid, which show a pearly lustre. It is colorless, white, pink, or greenish. Apophyllite occurs as a secondary mineral in basalt and other volcanic rocks. Excellent specimens are found in the United States at Bergen Hill, N. J., and throughout the Lake Superior region, as well as in Greenland, Mexico, the Harz region, and Nova Scotia. It is named from its tendency to exfoliate under the blowpipe.

AP'OPLEXY (Gk. ἀποπληξία, *apoplēxia*, from ἀπό, *apo*, away + πλήσσειν, *plēssein*, to strike). A term applied to an engorgement of blood, with or without extravasation, in the brain, producing coma. In medicine three distinct affections of the brain circulation are understood: cerebral *embolism*, cerebral *thrombosis*, and cerebral *hemorrhage*. These differ in their cause and somewhat in their symptoms. In cerebral *embolism* there is a sudden blocking up of one of the blood vessels of the brain by some foreign body in the circulating blood. Such foreign bodies usually come from the valves of the heart,

which in a number of septic diseases, as rheumatism, typhoid fever, gonorrhoea, etc., have minute growths upon them. These become detached and are swept into the circulation and may block up a brain artery. The symptoms come on acutely, may occur in the young or old, and may be slight, if a small vessel is blocked, or severe if the vessel is large. There may be sudden dizziness and weakness, going on to slight convulsive movements of one side of the body and loss of consciousness. This is accompanied by deep, noisy breathing, a slowing of the pulse, and perhaps a slight rise in temperature. The person may soon recover, usually with some weakness in some part of the body, or with a slight paralysis of some of the muscles of the leg, arm, or face. At times the whole of one side of the body may remain paralyzed.

Cerebral thrombosis is due to a disease of the blood vessels themselves, during which blood clots may form in them and thus cut off a portion of the brain substance from its normal supply of blood. Syphilis is the chief cause, especially in individuals under 40 years of age. The symptoms are apt to come on gradually. Following a period of headache, dizziness, and nausea, may occur sensations of prickling in the fingers; convulsive movements in some of the muscles, twitchings, or loss of muscular strength. At the time of attack the symptoms resemble those of embolism.

Cerebral hemorrhage is the most important cause of apoplexy. It occurs from the rupture of a blood vessel into the brain substance, and the severity of the symptoms depends partly on the amount of the hemorrhage, largely on the part of the brain involved. Hemorrhage is more apt to occur in the aged, and it is a frequent cause of death in those over 60 years of age. The symptoms may be sudden and terminate in death, or there may be several attacks of giddiness or collapse, with tingling or numbness of the extremities, or loss of speech. Patients may have several attacks and yet recover, with some persisting paralysis of one side of the body or of one arm or one leg. Little can be done before a physician comes. Mustard baths to the feet and the application of ice to the head may help in some cases. Persons with the "apoplectic habit" should take special care not to become mentally disturbed.

APOPLEXY, PARTURIENT. See MILK FEVER.

APORT'. See HELM.

APOS'PORY (Gk. *ἀπό, apo*, away from + *σπόρος, sporos*, seed). A name which literally means "without spore reproduction" and which refers to the fact that in some cases the sexual plant develops directly from the sexless one without the intervention of a spore. This phenomenon, like its correlative, *apogamy* (q.v.), has been especially observed among ferns, and the list of known forms which show it is increasing rapidly. Under certain conditions, which are not clear, a prothallium (the sexual plant) buds directly from various regions of the fern leaf, common among which are abortive sporangia and leaf teeth. Among mosses cases of apospory have been observed, and have also been induced artificially. In these cases a sexual plant is developed directly from the spore-bearing structure (the sexless plant). Among seed-plants apospory has not been observed and in the very nature of things is not likely to be found, one reason for this being that the sexual

plant is so very much reduced that it would hardly be observable, even if it were to appear vegetatively.

APOS'TATE (Gk. *ἀποστάτης, apostatēs*, deserter, renegade, from *ἀπό, apo*, away + *ιστάναι, histanai*, to place, to stand). Literally, any one who changes his religion, whatever may be his motive; but, by custom, a word always used in an opprobrious sense, as equivalent to renegade, or one who, in changing his creed, is actuated by unworthy motives. In early Christian times the word was applied to those who abandoned their faith in order to escape from persecution (see LAPSED); but it was also applied to such as rejected Christianity on speculative grounds, as, for instance (though in his case there had been no intelligent reception of Christianity), the Emperor Julian was supposed to have done. After the fifth century, when heathenism was declining, many who had no sincere belief in Christianity, yet made profession of it and were baptized; these also were styled apostates. The Roman Catholic church at one period imposed severe penalties on apostasy. The apostate was, of course, excommunicated, but sometimes, also, his property was confiscated, and he himself banished or even put to death. Those who embrace a religious faith are called "converts" by those they join and "perverts" by those they leave. The term "apostasy" is now employed commonly, and often abusively, as a reproach for great or sudden changes in political opinions.

A POSTE'RIO'RI. See A PRIORI.

APOSTLE (Gk. *ἀπόστολος, apostolos*, one sent forth as delegate, from *ἀπό, apo* + *στέλλειν, stellein*, to send). The name used in the New Testament to designate primarily that group of Christ's disciples who were called by Him to be His more intimate companions during His ministry, and to proclaim, as His representatives, the gospel to men. They were 12 in number: Simon Peter (surnamed Cephas, the Greek transliteration of the Aramaic *Kēphā*, 'rock,' of which the Greek *petros* is the translation, John i. 35-42), James (the son of Zebedee, Mark iii. 17), John (brother of James, Mark iii. 17; the two latter being surnamed Boanerges, Mark iii. 17), Andrew, Philip, Bartholomew, Matthew (the son of Alphæus, Hebrew name, Levi, Matt. ix. 9), Thomas (also called Didymus, John xx. 24), James (the son of Alphæus, Mark iii. 18), Thaddæus (called in Luke vi. 16 and Acts i. 13 Judas, the son of James, doubtless to distinguish him from Judas Iscariot, cf. John xiv. 22), Simon (the Canaanite, Mark iii. 18, of which the Greek equivalent is *Zēlotēs*, 'Zealot,' the surname given him in Luke vi. 15 and Acts i. 13), and Judas Iscariot.

Their qualifications, as understood by the early Church, were evidently that they should have been with Jesus during His ministry and have seen Him after His resurrection (Acts i. 21, 22). As a result, however, of exercising its rights in the election of a substitute for Judas Iscariot, in order to maintain the original number, and as a result, further, of admitting into this number an extra apostle in the person of the divinely appointed Paul, the Church evidently considered itself justified in modifying these qualifications so as to adapt the office to the needs of its developing mission. As a result, others prominent in this work received the name of apostle besides the Twelve and Paul. So James, the Lord's brother, though apparently not commissioned to any specific work, is hon-

ored with this title, in view, doubtless, of his special relationship to the Lord (Gal. i. 19) and his special witness to the Resurrection (1 Cor. xv. 7). So Barnabas, though lacking any relationship to the Lord and not having been a witness of the Resurrection, was given this title, because of his special appointment by the Church to the mission work with Paul (Acts xiii. 1-3; xiv. 4, 14). So, doubtless, the title came to be extended to those who, though not outwardly appointed to any specific work, gave evidence of their divine choice to it by the signal way in which they accomplished it, e.g., Andronicus and Junia (Rom. xvi. 7), Apollos (1 Cor. iv. 6, with 9), Silvanus and Timothy (1 Thess. i. 1, with ii. 6), and the body of apostles, which Paul seems to have in mind as extending beyond the twelve (1 Cor. ix. 5; xv. 5-7). This enlarged application of the term is recognized by patristic writers, such as the author of the *Didaché* and of the *Shepherd of Hermas*.

Among the credentials of the apostolic office were apparently the ability to work miracles (e.g., 2 Cor. xii. 12), and the conversion to God of those to whom they brought the gospel (e.g., 1 Cor. ix. 2). If the office possessed peculiar rights, among them doubtless were the appointment of the original officers of the local churches (e.g., Acts xiv. 23), as well as the regulation of the teaching and morals within the churches' organized limits (e.g., 2 Thess. iii. 6). The characteristic duty of the office consisted, most likely, in the preaching and missioning of the gospel (e.g., Acts vi. 2-4). At the same time, however, as to how far the apostolate was considered by the early Church as an office at all is a question of large debate.

There is no evidence of any division of territory among the twelve. The nearest approach to this is in the mutual understanding referred to in Gal. ii. 9, by which Peter was recognized as the leader of the mission to the circumcision, which would naturally mean, in general terms, the Palestinian Jews; and Paul and Barnabas were recognized as the leaders to the uncircumcision, which would as naturally indicate, generally, the Gentiles outside of Palestine; but even this was not strictly carried out, since Paul began his work in most places to which he went by preaching in the synagogue, while the epistolary address in 1 Peter would imply that Peter had a considerable parish of Gentile Christians in Asia Minor.

In 2 Cor. viii. 23 and Phil. ii. 25, in which passages Paul speaks of the messengers of the churches, the word *ἀπόστολος* is used in its common classical meaning of 'commissioned messenger,' and in Heb. iii. 1, where Christ is referred to as "the Apostle and High Priest of our confession," the word is applied in the same sense, from the point of view of Christ's divinely appointed mission into the world (cf. John xvii. 18). For details of apostolic life and work, see under individual apostles.

Bibliography. In general, see Lightfoot, "Excursus on Name and Office of an Apostle," in *Commentary on Galatians* (London, 1877); Weizsäcker, *The Apostolic Age* (Eng. trans., Edinburgh, 1894); Harnack, *Die Apostelchre* (2d ed., Leipzig, 1896); E. Haupt, *Zum Verständnis des Apostolats im Neuen Testament* (Halle, 1896); Allen, *Christian Institutions* (New York, 1897); Hort, *Ecclēsia* (New York, 1898); Falconer, *From Apostle to Priest* (New

York, 1900); T. M. Lindsay, *The Church and the Ministry* (New York, 1903).

APOSTLE OF FREE TRADE. A title frequently applied to Richard Cobden (q.v.), author of *The Exponent of the Principles of Free Trade*, for his persistent advocacy of the repeal of the high-tariff policy which England practiced from 1830 to 1846. He gave utterance to the strikingly accurate prophecy that America must at no distant date enter into serious competition with English products; that, in this competition, England would be heavily handicapped by protection, and that the soundest policy for her lay in the direction of free trade. A fluent speaker, he carried these theories into Parliament and was directly responsible for the repeal of the obnoxious duties on corn.

APOSTLE OF INFIDELITY. A term applied to Voltaire on account of his persistent attacks upon the Church, and his unfailing protection of those whom he believed to be persecuted by her. See VOLTAIRE.

APOSTLE OF IRELAND. A title given to Patrick, Bishop and saint, who, early in the fifth century, felt himself divinely inspired to attempt the conversion of Ireland, which was at that time a heathen country. See PATRICK, SAINT.

APOSTLE OF TEMPERANCE. Theobald Mathew, so designated through his great labors during the first half of the nineteenth century to further the cause of temperance in the United Kingdom and especially in Ireland, the country of his birth.

APOSTLE OF THE ARDENNES, är'dën'. An appellation given to St. Hubert, the son of the Duke of Aquitaine, in the reign of Theodoric, King of the Franks. He was converted from a gay life by the vision of a stag bearing a shining cross between its antlers. He was made Bishop of Liège in 708 and died in 728. A century after his body was transferred to the Benedictine convent of Andoin, in the Ardennes, which thence received the name of St. Hubertus. He was held to be the patron of hunting and the chase.

APOSTLE OF THE HIGHLANDERS. A Celtic missionary to the Caledonians, otherwise known as St. Columba; the founder of the monastery of Iona in or about the year 565.

APOSTLES, ACTS OF THE, APOCRYPHAL. See APOCRYPHA, *New Testament*.

APOSTLES, TEACHING OF THE TWELVE. See TEACHING OF THE TWELVE APOSTLES.

APOSTLES' CREED. See CREEDS.

APOSTLESHIP OF PRAYER. A Catholic association of prayer, founded at Vals, France, in 1844. In 1861 a priest, Rev. Henry Ramière, adapted its organization to general use and published a description of it in "The Apostleship of Prayer." It has had a rapid growth, its membership now numbering over 25,000,000, of which about 4,000,000 are in the United States. It is under the care of the Jesuit order and is directed by means of a journal, the "Messenger of the Sacred Heart." Consult *Handbook of the Apostleship of Prayer* (New York).

APOSTLES' ISLANDS, or THE TWELVE APOSTLES. A group of islands in Lake Superior, near the western end, belonging to Wisconsin (Map: Wisconsin, C 1). They number in all 27, with an area of 125,000 acres. The largest is Madeline Island, on which are La Pointe, a thriving town, and the La Pointe Indian Reservation. Others are Oak, Presque, and Outer

islands. This group was settled by French missionaries as early as 1680.

APOSTLE SPOONS. The name given to spoons, usually in sets of 13, the handles of which are formed by images of the twelve apostles and of the Virgin Mary. Up to the seventeenth century such sets were favorite christening gifts. Complete sets are quite rare. In 1904 such a set was sold in London for £4900.

APOSTLE TO GERMANY. A title given to St. Boniface, an English missionary (died 755), for his lifelong labors among the Frisian and German tribes.

APOSTLE TO THE ENGLISH. An appellation given to St. Augustine, who led the body of monks sent to England by Gregory I to "convert the Angles into angels."

APOSTLE TO THE FRENCH. An appellation of St. Denis (q.v.), the patron saint of France, who is said to have been beheaded about 272 A.D. at Paris.

APOSTLE TO THE GENTILES. A name applied to St. Paul because of his life-work—"to preach the gospel to all mankind."

APOSTLE TO THE INDIANS, THE. John Eliot, thus styled because of his efforts to convert the Indian tribes of New England in the middle of the seventeenth century. See ELIOT, JOHN.

APOSTLE TO THE SCOTS, THE. A term applied to the Scottish reformer and historian, John Knox (q.v.), because of his untiring exertions to spread the Calvinistic doctrines in Scotland at the expense of those of the English and Roman Catholic churches. Also called the Apostle of the Scottish Reformation.

APOSTOLIC, or AP'OSTOLICAL. An adjective used in various connections to denote something that is supposed to date from the age of the first apostles of the Christian Church, or to have received their sanction, or to rest upon their authority. As applied to a church, it means that the twelve apostles, or at least one of them, taught the truths it stands for. As applied to a doctrine or practice, it means that either it is taught in the New Testament or that traditionally it has been handed down from apostolic days. The claim to such origin, in particular cases, is much disputed by Protestants among themselves in regard to such points as infant baptism, immersion, and church government; and by Protestants over against Roman Catholics as to the priority of the Church of Rome and papal claims generally.

APOSTOLIC BRETHERN, or APOSTOLICI. The name given in Italy, toward the end of the thirteenth century, to one of those sects which, animated by the spirit of an Arnold of Brescia, felt constrained to oppose the worldly tendencies of the Church. Its founder was Gherardo Segarelli, a weaver in Parma. Rejected, from some cause or other, by the Franciscan Order; his long-continued and enthusiastic meditations led him to the profound conviction that it was above all things necessary to return to the simple forms of apostolic life. Accordingly, he went about (1260) in the garb of the apostles, as a preacher of repentance, and by his practical discourses gathered many adherents into a kind of free society, bound by no oaths. At first he managed to avoid any direct collision with the dogmas of the Church; but after 20 years of undisturbed activity and growing influence, Segarelli was arrested by the Bishop of Parma, who, how-

ever, soon after released him and kept him in his palace as his fool and in 1286 banished him from his diocese. Upon the occasion of his release, Pope Honorius IV renewed a decree of the Council of Lyons (1274) against all religious communities not directly sanctioned by the papal chair. In 1290, Nicholas IV setting himself to expose and persecute the Apostolic Brethren, they, on their side, began to denounce the papacy as the Babylon of the Apocalypse. Many, both men and women, perished at the stake, among them Segarelli (July 18, 1300). But his cause survived him. Dolcino, a more energetic and cultivated man, brought up as a priest, who had previously taken an active part in Tyrol against the alleged corruptions of the Church, now headed the sect in Italy. He taught the duty of a complete renunciation of all worldly ties, of property, settled abode, etc. Having retreated into Dalmatia, he announced from thence the dawning of the new era and in 1304 reappeared in upper Italy, with thousands of adherents, as the enemy of the papacy, at that time humbled and impoverished by France. In 1305 a crusade was preached against him. He fortified the mountain Zebello, in the diocese of Vercelli, but was, after a gallant defense, compelled by famine to submit. After horrible tortures, which he bore with the utmost fortitude, he was burned at Vercelli, June 1, 1307. In Lombardy and the south of France brethren lingered till 1368.

APOSTOLIC CONSTITUTIONS AND CANONS. The Constitutions are a collection of ecclesiastical ordinances, in eight books, erroneously supposed to have been the work of the apostles, and to have been written down by St. Clement. In the last chapter of the eighth book the so-called Apostolic Canons, 85 in number, are given. It is now recognized that both works are compositions of the fourth or the beginning of the fifth century. The theory most generally held is that the first six books of the Constitutions are based upon the *Didascalia*, a work of the last third of the third century; that the seventh book is a reworking of the *Didache*, a second-century work; and that the eighth book rests probably upon a collection based upon the Canons of Hippolytus (q.v.). The Canons were probably composed in Syria. The authority of the Constitutions was never accepted in the Western church, and was rejected by the Eastern at the Council of Constantinople in 692. The Canons were accepted by the Eastern church at that council. In the West the first 50 were translated by Dionysius Exiguus (q.v.), were incorporated in the *Decretum* of Gratian (q.v.), and, although held to be apocryphal, are considered an important source for the rules of the primitive Church. A translation of both may be found in the *Ante-Nicene Fathers*, vol. vii (Buffalo, 1886), and a bibliography in vol. ix (Buffalo, 1887). The original text was edited by P. Lagarde (Leipzig, 1862). For the Canons, consult especially Lauchert, *Kanones* (Freiburg and Leipzig, 1896); for the Constitutions, Funk, *Die apostolischen Konstitutionen* (Rothenburg, 1891).

APOSTOLIC DELEGATE. A permanent representative of the Pope in a foreign country. In countries having diplomatic relations with the papal court, he is a government official; elsewhere he is purely an ecclesiastical official. The Delegation to the United States was established in 1893. It has been held by Monsignors Satolli (1893-96), Martinelli (1896-1902), Fal-

conio (1902-11), and Bonzano (1911—). The ecclesiastical power of the Delegate in the United States is very great, his decision being final in all cases laid before him from the church courts.

APOSTOLIC FA'THERS. The name given to the disciples and immediate followers of the apostles, especially to those among them who have left real or so-considered writings behind them. These writings, in Lightfoot's edition, comprise the Epistle of Clement of Rome, and the so-called Second Epistle, which is not his; the seven Epistles of Ignatius of Antioch; the Epistle of Polycarp of Smyrna; the Martyrdom of Polycarp; the Teachings of the Apostles (the Didache); the Epistle of Barnabas; the Shepherd of Hermas; the Epistle of Diognetus; the fragments of Papias; and the Reliques of the Elders, preserved in Irenæus. The writings of the Apostolic Fathers, as to their form and subject, may be looked upon as a continuation of the apostolic epistles, though far inferior to them. They are very valuable as showing the beliefs and practices of the early Church. Editions of the Apostolic Fathers were published by J. B. Cotelerius (Paris, 1672); W. Jacobson (Oxford, 1838); C. J. Hefele (Tübingen, 1839); A. R. M. Dressel (Leipzig, 1857); Gebhardt, Zahn, and Harnack (Leipzig, 1876-78; text ed., 1877; 3d ed., 1900); J. B. Lightfoot (texts and Eng. trans., London, 1891; 2d ed., 1893). There is a separate English translation in *Ante-Nicene Library* (Edinburgh), vol. i (1867); *Christian Literature* editions (New York), vols. vii, ix. See the separate articles on the Apostolic Fathers mentioned above.

AP'OSTOL'ICI, or **AP'OTAC'TICI** (i.e., renunciants). A sect of heretics in Phrygia, Cilicia, and Pamphylia, in the third and fourth centuries, who renounced all their possessions, forbade marriage, and adopted an ascetic mode of life.

APOSTOLIC MAJ'ESTY. A title held by the kings of Hungary, conferred in 1000 by Pope Sylvester II along with the regal crown upon St. Stephen, ruler of Hungary, who had not only greatly encouraged the progress of Christianity but actually preached himself. In 1758 the title was renewed by Pope Clement XIII, in favor of Maria Theresa as Queen of Hungary, and it continues to be used by the Emperor of Austria as King of Hungary.

APOSTOLIC MENNONITE CHURCH. See MENNONITES.

APOSTOLIC PAR'TY. The name given in Spain early in the nineteenth century to a faction of fanatical Catholics who demanded the restoration of the Inquisition and the reëstablishment of the unlimited power of the King. They formed themselves (soon after the revolution of 1820) into an Apostolic Party, whose leaders were fugitive priests and whose troops were smugglers and robbers. They were popularly supposed to be ruled by a committee known as the Apostolic Junta. After taking an active part in all the subsequent agitations, they finally merged (1830) in the Carlist Party.

APOSTOLIC SUCCESSION. The doctrine that the powers of the Christian ministry are transmitted from Christ to those called to that ministry through those themselves consecrated to episcopal authority and office who trace their authority back by successive ascent to the Apostles; the system by which the Church, as an organic body, is made self-perpetuating, and by

which the fullness of corporate life, the integrity of essential truth divinely revealed and committed to the Church, and the validity of Sacraments are maintained unimpaired. The ground for establishing this doctrine is held to be the continuous teaching and practice of the Church from and including the Apostles' times, witnessed to by the New Testament, especially the teaching of Christ and that of the epistles of St. Paul to Timothy and Titus, and further evidenced by writers of the Apostolic age and documents preserved in the works of later writers. The most important of this class of authorities outside the New Testament are the Epistles of Ignatius, the Teaching of the Twelve Apostles, the Epistle of St. Clement to the Corinthians, and the earliest ecclesiastical canons, which order that the consecrators to the episcopate shall be not fewer than three, the purpose being primarily to secure the transmission through a network of lines rather than a chain of single links, and secondarily to insure the public consent of the Church. It is strictly insisted upon by Eastern, Roman Catholic, and Anglican churches, none of which recognizes as valid the acts of those who have not received ordination from a bishop in the succession. In recent times controversy has arisen as to the maintenance of the succession in the Anglican church during the sixteenth century. The Bull of Leo XIII, set forth on the Roman Catholic side, lays stress on the question of sufficient intention in consecrations during the sixteenth century. A few minor bodies, like the Vaudois, the Moravians, and the Swedish church, assert that they can trace some kind of succession in a direct line to the Apostles. See BISHOP; ROMAN CATHOLIC CHURCH; PARKER, MATTHEW. Consult Haddan, *Apostolic Succession in the Church of England* (London, 1869); Gore, *Church and Ministry*, and *Roman Catholic Claims* (1894); Moberly, *Ministerial Priesthood* (1898); Denny, *Anglican Orders and Jurisdiction* (1893); Brightman, *What Objections have been made to English Orders* (1896); the *Catholic Cyclopædia* (1909).

APOS'TROPHE. See CHLOROPLAST.

APOTH'ECARY. See CHEMISTS AND DRUGGISTS.

APOTHEGM, ἀπό-θημ (Gk. ἀπόφθεγμα, *apophthegma*, an utterance). A term used to designate any truth or maxim sententiously expressed. The oracles of the heathen gods often took this form, as also the proverbs, memorable sayings, etc., of the sages of antiquity. In modern times Lord Bacon has made a charming collection of apothegms.

AP'OTHE'OSIS (Gk. ἀποθέωσις, deification, from ἀπό, *apo*, away + θεός, *theos*, god, deity). The raising of a mortal to the rank of a god. From the polytheistic point of view, there is nothing monstrous in this idea; on the contrary, it is quite natural, and a necessary part of the system. Among pagans generally, and especially among the Romans, every departed spirit became a deity (see LARES; MANES); "and as it was common for children to worship (privately) the *manes* of their fathers, so was it natural for divine honors to be paid publicly to a deceased emperor, who was regarded as the parent of his country." The deification was accomplished by a formal decree of the Senate; henceforth the emperor so deified was called *Divus*. At the *Consecratio*, as it was called, of a Roman emperor, the body was burned on a funeral pile, and, as

the fire ascended, an eagle was let loose to mount into the sky, carrying, it was believed, the soul of the emperor from earth to heaven. Many coins of deified Roman emperors are found with the word *consecratio* surrounding an altar, with fire on it. Other members of the imperial family, including women, were deified. Divine honors were also paid to living persons, as to Julius Cæsar and Augustus. This latter practice originated in the Orient, and was adopted, at a late date, by the Greeks; Lysander, Philip of Macedon, and Alexander the Great were so worshiped.

APOTOME. In Greek music. See LIMMA.

APOX'YOM'ENOS (Gk. ἀποξυόμενος, scraping one's self, from ἀπό, *apo*, away + ξύειν, *xyein*, to scrape). A well-preserved marble copy in the Vatican of a statue by Lysippus, representing an athlete scraping himself with the strigil. It was found in Trastevere, at Rome, in 1849. The original was in bronze, and stood in front of the baths of Agrippa.

AP'PALACH'IAN MOUNTAIN CLUB. A society of persons interested in the mountains of New England and adjacent regions. It was organized in 1876, incorporated in 1878, and authorized by legislative act of 1894 to hold mountain and forest lands and historic sites. In addition to fostering the love of nature, it aims to preserve the beauty of mountain forests and resorts, to render them attractive to visitors, to publish accurate maps, and to collect scientific data concerning the mountains. In 1893 it took the initiative in the creation of the Metropolitan Park system of Greater Boston. *Appalachia*, the club journal and its principal literary expression, has (1913) reached 48 numbers, constituting 12 complete volumes; an annual *Register* has been published since 1879, and a *Bulletin* which presents the current affairs of the society, monthly since 1907. Several books relating to mountaineering, etc., have also been published under its auspices. Its library consists of over 2500 volumes, 1000 pamphlets, 2000 maps or sets of maps. The notable Sella Collection, containing some 600 photographic views from the principal mountain ranges of the world, is one of its most valuable assets. Frequent meetings are held in Boston from October to May, at which lectures of geographic interest are presented, to many of which the public are invited. The membership in March, 1913, numbered 1744.

APPALACHIANS. The general name for the extensive mountain system in eastern North America, extending in a northeast-southwest direction from Newfoundland to central Alabama, consisting largely of parallel chains separated by deep valleys. It is narrowest in New York and is sharply broken by the Hudson River, and again by the valley of New River, into three divisions. At its southern end the system curves slightly to the westward, and beyond the Mississippi valley is resumed as the Onachita uplift of southern Arkansas and Indian Territory.

General Character. The uplift may be described as a long, narrow tableland, from 100 to 300 miles in width, with an altitude of 1500 to more than 6000 feet. In the United States it is bordered on the east by the well-defined Blue Ridge, and on the west by the Alleghany Plateau escarpment, which two ridges lie approximately parallel, and 75 to 100 miles apart, throughout their lengths. Between these outer ranges lie a great number of smaller disconnected mountain ridges, chiefly parallel to the

main axis of the system in the central and northern part, but much broken in the southern and southeastern Appalachians. These mountain ridges maintain a remarkably uniform altitude, gradually increasing from both directions toward the central mass in western North Carolina. Lying between the comparatively narrow and regular wall of the Blue Ridge and Alleghany ranges, west of it, is the great Appalachian valley, which is a characteristic feature of the topography, for it extends the entire length of the mountain system. Here and there it is broken by minor ridges into two or three parallel valleys, but the general nature of a trough between mountain ranges is maintained throughout. In New York it is known as the Wallkill valley; in Pennsylvania, the Lebanon, Lancaster, and Cumberland valleys; in Virginia it is the historic Shenandoah valley, or "Great Valley of Virginia"; and still farther south it is the Tennessee valley, extending into Alabama and Georgia.

Divisions. The Appalachian system has not a uniform conformation throughout its extent, but is divided into three sections, the Northern, the Central, and the Southern Appalachians, with the lines of separation as stated above. This division is not merely of an arbitrary nature, but is founded on well-marked differences in the structural and physiographic features of the three regions. The Northern division includes the Green Mountains, the White Mountains, the highlands of Maine, the Shickshock Mountains, the Notre Dame Range of Quebec, and terminates in the hills of Newfoundland. In the central division the Blue Ridge Range has gentle slopes, rising usually to rounded crests, which show a gently undulating sky line, with here and there a peak rising a little higher than the usual level. (See BLUE RIDGE.) To the west of this ridge is a more or less elevated northerly extension of the great Appalachian valley, which in general presents a succession of depressions and heights, the former worn by streams to a depth, in some cases, of 200 feet, while the latter rises to a height of usually less than 1000 feet above the depressions. The Alleghany Mountains rise west of the valley in bolder sculpturing than that of the Blue Ridge, the side toward the great interior valley, the "Alleghany front," or escarpment of the Alleghany Plateau, being steep and rugged; but on the side of the Mississippi valley the slope is gradual, descending westward in lessening ridges from the crest which marks the summit region; this configuration is due to the fact that the stratified rocks (see below) incline westward, exhibiting their upturned edges in precipices toward the east. Beginning with the Catskills, the line is broken by the broad valley of the Delaware, but reappears in several prominent ranges in Pennsylvania. The westernmost, or "front," range, is confusingly called First, or Blue, Mountain, with Peter's, or Second, Mountain, behind it, east of the Susquehanna. East of the Susquehanna, the Tuscarora, Blacklog, Jack's, Standing Stone, and Tussey's are well-defined ranges westward, filling the whole region with crowded heights to the long range distinctively termed Alleghany, which stretches from the border of New York down into West Virginia. In the Virginias both the Blue Ridge and the western ranges become loftier and better defined. The front range is here called the Great North Mountain, and west of it lie successively the Shenandoah and several broken ranges, ris-

ing to the continuation of the Alleghanies proper. These draw together at the southwest extremity of Virginia, where a new uplift, the Cumberland Mountains (q.v.), rises west of them and terminates in the Clinch Mountains. The Southern Division extends from the valley of New River, in Virginia and West Virginia, southward. The valley of the Tennessee makes a break, south of which the range reappears in the prolongations of the Cumberland Mountains in northern Alabama. In New Jersey the "Highlands" of the Blue Ridge rise to heights of 1000 to 1500 feet; in Pennsylvania to 2000 feet; in Virginia from 2000 to 4000 feet (Hawk's Bill, 4066 feet), and with a breadth of 16 miles. In North Carolina, near the Virginia line, the Blue Ridge forks, the Unaka Mountains, of somewhat greater altitude but of lesser continuity, branching off toward the southwest, while the Blue Ridge proper takes a more southerly course. The Alleghanies, which really begin with the Catskills, in New York State (highest 4200 feet), have in the northern part a general elevation of about 2000 feet, which increases to 4400 feet in Virginia and Kentucky, and still farther south decreases from 200 to 2500 feet. The absence of any isolated peaks is highly characteristic of the whole Alleghanian region; the mountains everywhere present the appearance of long, evenly topped ridges, and the name applies to the whole ridge.

The prominence of the Blue Ridge is the characteristic feature of the central division of the Appalachians. This rises suddenly from the Piedmont Plateau, east and south of it, to heights far greater than the Alleghanies attain. Beginning prominently in South Mountain, in southern Pennsylvania, it stretches southwestward in greater and greater heights, through Virginia and western North Carolina, where it divides, the northern branch continuing westward to Georgia as the Unaka, or Great Smoky Mountains. These form a broad mass of mountains on the border between North Carolina and Tennessee, containing peaks exceeding those of the White Mountains of New Hampshire, and consequently the highest east of the Rocky Mountains. The culminating group, reaching in Mount Mitchell 6710 feet, is known as the Black Mountains (q.v.), and contains many peaks above 6000 feet in height. The Unaka Mountains are characterized by the great sharp-ridged spurs which leave the main chain and preserve its height for a distance of several miles; between these spurs are deep valleys only wide enough at the bottom for the creek-beds which are invariably found there. The altitudes of the extended valleys in this great highland region are from 2000 to 3000 feet. To the west of the steep-sided Unaka ridge lies a valley, about 50 or 60 miles wide, in Tennessee, which contains the Tennessee River and its tributaries, the Clinch, Holston, and French Broad.

Geology. The Appalachian Mountains are folded mountains; i.e., they have been formed by plications or folds of the rock layers that make up the crust of the earth in this region, and the particular type of plication is so well developed in this region that it has received the name of the "Appalachian type" of folding. The Blue Ridge, along the eastern side, consists of layers of crystalline rocks, the oldest known in the Appalachians, that have suffered so great an amount of metamorphism as to render the determination of their exact age a matter of

considerable difficulty. They are grouped under the term "fundamental complex," and it is certain that they are in large part pre-Cambrian; and some are even Archæan on the eastern edge of the Blue Ridge. On the western edge isolated masses of Cambrian rocks are found. All these rocks of the Blue Ridge have been much folded and compressed, so that the layers now stand almost on end and are even overturned. Great faults and overthrusts are common, and add to the difficulty of unraveling the structure of the district. In the Appalachian valley the geological structure is also quite complex, though the strata are not so intensely metamorphosed. The rocks are limestones, shales, and sandstones, and they lie in closed folds that become more open toward the western side of the valley. These folds are peculiar in that their eastward slopes are always steeper than the westward. When the folds are overturned, the inversion is toward the east; and overthrusts are also toward the east and often of considerable extent. This valley is largely the result of the erosion of a great limestone formation, of Cambro-Silurian age, that extends its entire length. The Alleghany Mountains consist of rocks of Paleozoic age, Cambrian to Carboniferous, inclusive, that have been elevated into folded ridges and then eroded to their present topography. The softer beds have been worn into valleys, and the harder beds, having resisted erosion, have been left to form the ridges and benches. In this limestone also have been eroded the wonderful series of caves of the Shenandoah valley and elsewhere, of which that at Luray, Va., is a striking example. (See CAVES.) Anticlinal and synclinal folds alternate in diminishing intensity toward the west, where they disappear in the nearly horizontal beds of the Cumberland Plateau, which is made up of Carboniferous rocks.

Drainage Development. The region now occupied by the Appalachian Mountains has been the scene of many physiographical changes too complex to explain here. At a comparatively recent time, however, the whole of the Appalachian system consisted of a great rounded plateau with an elevation of perhaps 4000 feet, the surface of which is called by geologists the Kittatinny Plain. Above this plain arose to a moderate height the now high mountains of western North Carolina. Along a central zone the land increased in altitude to a region in Virginia which thus became the watershed. The rain now did its work, and the great rivers—the New, the Roanoke, James, Potomac, and Susquehanna—cut out their paths through the then nearly level region, and a well-developed system of highlands and drainage was established. However, the subsequent elevation of land in this region by amounts ranging from 200 feet in the north to 1700 feet in Virginia, once more disturbed the adjustment of the water systems and gave a new impetus to the work of the flowing waters.

While the Appalachian Mountains form the watershed between the Atlantic slope and the Mississippi valley, yet throughout there is no definite watershed line on one side of which the rivers flow to the west and on the other toward the east. In the northern part the streams chiefly break through the mountains from the western side to the east. In the middle part some escape toward the east and some toward the west; while at the south the eastern mountain range of the Blue Ridge forms the watershed. The water-courses appear to be independ-

ent of the direction of the mountain ranges, and instead of pursuing what appear to be the natural directions along the present great valleys, they flow across the ridges through deep gaps in them. This peculiar circumstance is due to the fact that these gaps were cut by the streams before the intervening ridges were upheaved.

The chief streams draining the eastern slopes of the central and southern divisions of the Appalachians into the Atlantic are the Hudson and its branches on the west; the Delaware, Schuylkill, Susquehanna, Potomac, and the James, which cut their way eastward through the mountain ranges; and the Rappahannock, Dan, Yadkin (Pedee), Catawba, Broad, Saluda (branches of the Santee), and the Savannah, which rise from the eastern slope of the Blue Ridge, whose western slopes drain into the Susquehanna, Shenandoah (Potomac), James, or Tennessee. On the south are the Chattahoochee (head stream of the Apalachieola) and the Coosa (head stream of the Alabama), flowing into the Gulf of Mexico. The streams draining the Appalachian region on the west are tributary to the Ohio River. They are the Hiwassee, the Little Tennessee, and the French Broad, which flow from the Blue Ridge through a network of high mountains and break through the great Unaka range to the Tennessee; the Holston and Clinch rivers, also tributaries of the Tennessee; the Cumberland, the New (head of the Kanawha), the Little Kanawha, Allegheny, and Monongahela. The last two join to form the Ohio. The rivers draining the northern section are the St. John, Penobscot, Kennebec, and Connecticut.

Climate. The climate of the Appalachian Mountains must be characterized as temperate, as they extend from a region in which the average annual temperature is 46° F. southward to a region of 61° F. The region, therefore, partakes of the general climatic conditions of its latitude, modified by its altitude. As the prevailing winds come from the southwest, they do not bring much moisture, and the rainfall and snowfall are not excessive, though greater upon the heights of the central ranges than in the lower areas outside. The rainfall for the year averages about 40 inches throughout most of the Appalachian region, but in the southern section increases to 60 or 70 inches. Droughts frequently occur at the north, but seldom at the south. On the whole, the summer climate of the Appalachian region is delightful, and its charms are becoming more and more appreciated by summer visitors. This attractiveness is increased by the abundance of vegetation, the beautiful scenery, in which grandeur may often be found, and particularly by the presence in many parts of the mountains of springs of saline, chalybeate, and other mineral-bearing waters, both hot and cold. These medicinal waters, together with the purity and energizing character of the air, have long given the mountains, especially in North Carolina and Virginia, a high repute as a health resort.

Vegetation and Fauna. The Appalachian region is principally covered with the climax deciduous forest of eastern North America, viz., that known as the beech-maple-hemlock forest. It differs from the same forest in more northern areas by the presence of such trees as the chestnut, many species of oak, tulip, and magnolia, but such northern forms as the black and yellow

bireh, the white ash, and the hickories still persist. This forest is marked by great luxuriance and by the large size of many of the trees composing it. In the undergrowth laurel (*Kalmia*) and rhododendron are abundant, especially towards the south. Upon the higher slopes of the mountains the more xerophytic oaks and conifers are abundant. Among the latter are such northern species as the white pine, the balsam fir, and the black spruce, and the more southern *Pinus rigida*, *P. pungens*, and *P. mitis*. Such northern shrubs as *Acer spicatum*, *A. pennsylvanicum*, and *Sorbus americana*, together with several species of *Vaccinium*, are prominent in the undergrowth. The she-balsam, *Abies fraseri*, the Carolina hemlock, *Tsuga caroliniana*, and the mountain-rose bay, *Rhododendron catawbiense*, are found only above 2000 feet from Virginia to Georgia, and a vast array of northern shrubs and herbs reach their southern limit along the same elevations. Of the larger mammalia bears, deer, wildeats, are still common, but by no means plentiful. Wolves and panthers have practically disappeared. Small game birds and foxes are plentiful. At the South wild turkeys are still found. Unfortunately rattlesnakes and copperheads are to be found all over the mountains, yet rarely in dangerous numbers. The woods and streams abound, beyond almost any other part of the Temperate Zone, in fresh-water mollusks.

Mineral Resources. Economic products of considerable importance are found in the Appalachian system. Coal (q.v.) is far the most important; the entire anthracite field and part of the bituminous field of Pennsylvania and other states lie in the Alleghany Mountains and the Cumberland Plateau or its northern extension. The petroleum and oil fields of New York, western Pennsylvania, and southward, barely touch the edge of the Appalaehian region. Of the metals, iron occurs as hematite, limonite, and magnetite at many localities; zinc is found in association with magnetite at the well-known localities of Franklin Furnace and Ogdensburg, N. J., and as blende, calamine, etc., associated with lead, at the Bertha Mines in Wythe County, Va. Lead has been found in small amounts at many points, but does not occur in sufficient quantity to constitute an independent industry. Copper is found native in the crystalline rocks of Virginia, and as chalcopyrite often in large masses, as at Ducktown, eastern Tennessee. Gold and silver occur in small amounts chiefly in Georgia and North Carolina; nickel and cobalt are also found sparingly. Bauxite, one of the ores of aluminum, has assumed great importance in Alabama, and manganese has been mined in large quantities in Tennessee and Virginia. Natural cement, of such high grade as to make it a rival of Portland cement, is found at many outcrops of the Upper Silurian formations in New York, New Jersey, Pennsylvania, and Maryland, and lime is burned throughout the region. Building stone of good quality is abundant, and slate of excellent grade is quarried in New Jersey and Pennsylvania. Asbestos, mica, garnet, and emery are mined in Virginia, the Carolinas, and Georgia, and gems of many kinds are found in the Blue Ridge. The entire Appalachian system had a distinct influence on the early history of North America and the United States. It formed a great barrier to western settlement that was only permanently overcome when the pioneers of Daniel Boone's time, 1775, broke through the passes and secured a footing

in the Kentucky and Ohio valleys. Previously the Hudson and the Mohawk valleys offered the only practicable highway into the interior of the continent, and the indomitable warriors of the Iroquois effectually blocked that path, their settlements being distributed from Albany to Buffalo and their several political divisions lying transversely across the State of New York.

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AP'PANAGE, or **APANAGE**. A French word which originally meant a provision for younger children when the main inheritance descended by primogeniture. Then it came to be the name applied in feudal law to contributions from the exchequer granted for the maintenance of princes of the royal house, or to lands and the revenues of lands set apart for the same purpose. Territorial appanages were bestowed either for life or upon a man and his direct heirs forever. It is of importance historically only in French history. Under the kings of the Capetian line it became the custom to set apart a valuable territory as the provision for the maintenance of each one of the younger sons and sometimes of the daughters. This custom was a constant source of danger to the policy of consolidation which had made the Capetian line strong, but it was persisted in until the end of the monarchy, in spite of attempts by statute to limit appanages to money or property other than land. In 1810 appanages were established by law for the descendants of Napoleon. By the Restoration their appanage was restored to the Orléans family, and this, which was united to the crown in 1832, was the last appanage in France. In England the Duchy of Cornwall is in form an appanage of the Prince of Wales; but other members of the royal family in Great Britain, as well as in most of the continental monarchies, are now provided for by annual grants from the Civil List. A survival of the appanage in Germany and Austria is the permanent endowment sometimes granted by the state to the princes of mediatised houses.

AP'PARA'TUS (Lat. from *ad*, to + *parare*, to make ready, prepare). In the sciences, a collection of tools or instruments for experimenting or working. In physiology, a group or collection of organs associated in a single function; as, the heart, veins, and arteries are the circulatory apparatus; the legs are the apparatus of locomotion, etc. The term is applied also to any materials used in the comparative critical study of a document.

APPARATUS, PSYCHOLOGICAL. See PSYCHOLOGICAL APPARATUS.

APPARENT (Lat. *ad*, to + *parere*, to come forth, be visible). A term used to express a number of important distinctions, especially in astronomy. The *apparent diameter* of a heavenly body is the angle formed by two lines drawn from the opposite ends of a diameter to the spectator's eye; this obviously depends upon the distance of the body as well as upon its real magnitude; it is also called the *angular diameter*. A planet seen from the surface of the earth seems nearer the horizon than if seen from the centre of the earth: what is seen from the surface of the earth is the *apparent altitude* of the planet; its real altitude would be seen if an observation could be made from the centre of the earth. The apparent altitude differs from the true on account of parallax and refraction (qq.v.). *Apparent noon* (called also *true noon*) is the time when the visible sun is on the meridian; mean noon is the time when the sun would be on the meridian if his motion in the heavens were uniform and parallel to the equator. (See EQUATION OF TIME.) The daily and annual motions of the sun in the heavens are both *apparent motions*, caused by two real motions of the earth. In general, apparent phenomena are the phenomena of the actual visible heavenly bodies, while the corresponding true phenomena are what the former would be if certain disturbing causes were eliminated.

APPARITION (Lat. *apparitio*, an appearance, from *ad*, to + *parere*, to come forth, be visible). An illusion or hallucination in which objects, commonly human beings, are seen with such vividness as to be regarded as real. The hallucinations of delirium or insanity are not included under this term. Before the diffusion of modern science, there existed a well-nigh universal belief in the reality of apparitions. Greek and Roman poetry abounds with instances; folklore owes much of its attractiveness to its wealth of spectres and phantoms, fairies and brownies, and its witches and ghost-haunted houses. Dr. Johnson voices the universality of this belief, and, incidentally, gives us a glimpse of a vein of superstition and credulity in his nature when, in his *Rasselas*, he causes Imlac to say: "That the dead are seen no more I will not undertake to maintain against the concurrent testimony of all ages and all nations. There is no people, rude and unlearned, among whom apparitions of the dead are not related and believed." It is not difficult to understand how the untutored savage, encouraged by the events of his dream consciousness which led him to believe in a spirit-self existing apart from its body-self, should come to have an equally strong belief in the externality of the apparitions which he saw in his waking consciousness. Indeed, authorities are not wanting who see in the attitude of early man to apparitions the most important, if not the unique, origin of religion. Whether this be true or not,

we know that many social phenomena which present religious phases (e.g., witchcraft) have owed the possibility of their existence largely to a widespread belief in apparitions.

The reign of universal superstition has, it is true, given way before the onward progress of the scientific spirit; but the more subtle variations of the belief in apparitions have not as yet entirely disappeared. There still prevails a belief in the supernormal nature of apparitions as manifested in clairvoyance (q.v.), telepathy (q.v.), and spiritualism. We need refer, for example, only to the birth in 1847 of modern spiritualism, as a direct descendant of the belief in "haunted houses." In 1882 the Society for Psychical Research was instituted in England. One of its express purposes was to collect data upon the subject of apparitions. Much material has been published in the "Proceedings" of the Society, and in book form by Gurney, Myers, and Podmore. These authors express the relation of apparitions to telepathy in the following passage: "This book, then, claims to show (1) that experimental telepathy exists, and (2) that apparitions at death, etc., are a result of something beyond chance, whence it follows (3) that these experimental and these spontaneous cases of the action of mind on mind are in some way allied." The opposing position is that of Buckley, who asserts that "before endeavoring to explain how phenomena exist, it is necessary to determine precisely what exists; and so long as it is possible to find a rational explanation of what unquestionably is, there is no reason to suspect, and it is superstition to assume, the operation of supernatural causes." If we apply this criterion to the lately collected evidence for apparitions, we must discount for errors of observation, for errors of memory, and for the strong influence of autosuggestion (q.v.). We shall then find that we have left certain unexplained phenomena. Those who do not believe in apparitions account for these as illusions or hallucinations (q.v.).

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APPEAL' (from Lat. *appellare*, to address, appeal to, call, summon). In English legal procedure, a term that has two distinct meanings.

1. It denotes an accusation by a private person against another for some heinous crime, demanding punishment on account of the injury to the appellant, or a member of his family, or, in case of treason, against the king. The person appealed, known as the appellant, was entitled to trial by battle (q.v.) if he demanded it. This method of prosecution remained in force until abolished by Act of Parliament in 1819 (59 Geo. III, c. 46), although it had been used but rarely for a century prior thereto. The last appeal of murder brought in England (which led to the enactment of the statute above referred to) was that of Ashford *vs.* Thornton, instituted in 1818, and reported in 1 Barnwell and Alderson, 405. Consult Blackstone, *Commentaries*.

2. The other signification of the term is that of a complaint to a superior court of an unjust judgment rendered by an inferior tribunal. The

object of the appeal is to secure the reversal or modification of the judgment or decree of the inferior court through the intervention of the superior tribunal. Originally the word was confined to a proceeding for the review of a decision in an equity, an admiralty, or an ecclesiastical cause. Common-law judgments were reviewed by a writ of error. The chief distinction, between a writ of error and an appeal was that the former brought before the higher court only errors of law committed in the court below, while the latter brought up for review findings of fact as well as of law. The tendency of modern legislation is toward the abolition of forms of action, and as a consequence the method of appeal has generally come to supersede the writ of error, both in England and the United States. (See ERROR, WRIT OF.) The grounds of appeal, the courts to which an appeal may be taken, and the methods of prosecuting appeals are regulated in the various jurisdictions by statutes and court rules. These are so diverse that no attempt will be made here to state their provisions. See COURT; PLEADING.

In parliamentary law, appeal denotes the proceeding by which a member tests the correctness of a ruling of the presiding officer by calling for a vote of the meeting thereon. See PARLIAMENTARY LAW.

APPEAR'ANCE (for derivation, see AP-PARENT). A term used in its most general meaning to signify what is presented in consciousness. It is that of which consciousness is cognizant as an object distinct from itself. For instance, in a perception I may have of a piece of money, its yellowness, its weight, its hardness, are all appearances to me. Now, the fact that appearance is always related to consciousness raises a metaphysical problem; viz., Is there anything more ultimate, more real, than appearance? And, if so, are the yellowness, the weight, the hardness, and other appearances of the coin really a revelation of what the coin is in its deepest nature, or are they merely the form in which that ultimate nature, whatever it may be, is disguised when it comes into my consciousness? Different schools of philosophy have given different answers to these questions, but a careful examination of the answers shows that they are all determined by the view taken of the nature of reality.

1. Assume that there is a reality different from appearance, that what a thing really is is what it is in absolute independence of all its relations; assume that "we must everywhere distinguish between the intrinsic being of a thing and its relations," adding that knowledge is always a relation, and it becomes clear that the reality of the thing, its intrinsic being, need not be revealed in the appearance it presents to consciousness. In fact, the question arises whether appearances must not be always deceptive. An affirmative answer to this question is the fundamental tenet of dogmatic skepticism (q.v.) and of critical philosophy. (See KANT.) A suspense of judgment on the problem is the attitude of the ancient Skeptics. A negative answer given without giving a reason for it is the attitude of dogmatism. A negative answer can be justified only by showing the nature of consciousness to be such that the presence of a reality in it does not necessarily transform it from what it is in its ultimate character. This is what some conceive to be the problem set by the science of epistemology, or theory of knowl-

edge. See KNOWLEDGE, THEORY OF. Recent realists have developed a theory of consciousness which, they believe, solves the problem. See REALISM and NEW REALISM.

2. Assume we do not and cannot know whether there is a reality distinct from appearance, but that at least we have the conception of its possibility, and the result of this confession is a critical skepticism.

3. Assume that there is no reality *apart* from appearance, and we have on the one hand Positivism (q.v.), and on the other the idealistic systems of philosophy.

Thus the attitude taken toward appearance may form the basis for one of the most convenient classifications of the different systems of philosophy.

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APPEARANCE. The legal proceeding by which a defendant brings himself, or is brought, into court and made subject to its jurisdiction. In modern judicial procedure the actual presence of the defendant is, in civil cases, dispensed with, a written "appearance" being entered in lieu thereof, though in criminal proceedings, especially in cases of felony, actual presence is still generally necessary in order to give the proceedings regularity. In neither case, however, is appearance necessary to give the court jurisdiction of the person of the defendant, that being effected by the service of the process whereby the action is instituted. The usual method of making appearance is for the party to plead, i.e., put in his answer or defense, though it may be done formally, by serving upon the opposing party a regular notice of appearance, or, informally, by any act whereby the jurisdiction of the court is recognized, as by demanding or submitting to a preliminary examination. In civil cases appearance is usually by attorney. See ACTION; ANSWER; PLEADING; PROCEDURE.

APPEND'ANT RIGHTS (Lat. *ad*, to + *pendere*, to hang). In English law, certain common rights in the land of another (such as common of pasture) which have existed from time immemorial, and which are historically appurtenant to the land of the person claiming the right. They differ from *appurtenant rights* in that the latter, though also connected with the land of the claimant, may be of modern origin and may be acquired by ordinary prescription (q.v.) or by grant; whereas appendant rights are invariably ancient and cannot be created at the pleasure of the parties. For this reason the number of such rights is limited and cannot be enlarged. They are probably survivals of community rights in common lands, which have persisted notwithstanding the inclosure of such lands and their appropriation by private owners. See APPURTENANCE; EASEMENT; PROFIT À PRENDRE; REAL PROPERTY.

APPEN'DICI'TIS. See VERMIFORM APPENDIX.

APPEN'DIX VER'MIFOR'MIS. See VERMIFORM APPENDIX.

APPENZELL, ä'pen-tsöl' (anciently, Lat. *Abbatis Cella*, abbot's cell). A canton in the northeastern part of Switzerland (Map: Switzerland, D 1), encircled by the canton of St. Gall. It is situated in the heart of the Alps and is noted for its scenic beauty. Altitudes range from 1300 feet, the lowest elevation, to 8215 feet in Sentis. Other prominent points are Jeiden, Wildkirchli, St. Anthony's Chapel, Ebenalp, and the Hone Kasten. The Sitter, a tributary of the Thur, is the chief river. The lofty mountains preclude agriculture on a large scale, but the pasture land is the richest in Switzerland. After the religious wars of 1597 a change was effected in the government of the canton along religious lines, whereby were formed two half-cantons, Ausserrhoden and Innerrhoden, each having an independent local government with representation in the Federal Parliament. Innerrhoden, almost entirely Roman Catholic, is 63 square miles in area and had in 1910 a population of 14,631, engaged principally in cattle raising. The women make beautiful hand embroidery. Trogen, the capital, which had in 1910 a population of 2347, is pleasantly located and is a summer resort. Ausserrhoden, the seat of the Reformed church, 96 square miles in area, had in the same year a population of 57,723, mostly employed in cotton and silk manufacture, chiefly for firms in St. Gall. The capital, Appenzell, had, in 1910, a population of 5126. It was at one time the country-seat of the abbots of St. Gall and is very interesting to-day.

AP'PERCEPTION (Lat. *ad*, in addition to + *percipere*, to seize entirely, observe, perceive). A term first employed by Leibnitz (1646-1716), for whom it signified a spontaneous activity of the ego which exercised such a modifying influence upon the crude "perceptions" of sense that they became transformed into clear and ordered elements of knowledge. This metaphysical concept was used by Kant (1724-1804) in his epistemology, with sharp emphasis upon the spontaneity of the activity. On the other hand, the term was taken over into psychology by Herbart (1776-1841) and his followers, has been reformed and exhaustively treated by Wundt, and more recently has received extended discussion at the hands of the English psychologist Stout.

Herbart and his school, especially Lazarus (1824-1903) and Steinthal (1823-99), lay stress upon the practical significance of apperception. This principle forms, indeed, the corner-stone both of their psychology and of all modern theories of education based upon it. Apperception is "that psychical activity by which individual perceptions, ideas, or ideational complexes are brought into relation with our previous intellectual and emotional life, associated to it, and thus raised to greater clearness, activity, and significance." The mental resultant of previous experience wherewith we meet and receive a new experience is termed an "apperception mass." There will, of course, be individual variations in the nature of this mass; different minds are unequally prepared for a particular experience. One child will call butterflies "flying pansies"; another knows them to be insects. Thus, from the Herbartian standpoint,

it is of extreme importance for the teacher to acquaint himself with the existing store of ideas in the minds of the children under his charge, in order that the new matter which he presents may be received by appropriate thought-attitudes.

Wundt's treatment combines the psychological acumen of Herbart with the Kantian emphasis upon spontaneity as the characteristic feature of apperception. It includes a careful analysis of the experience of spontaneity into its ultimate psychical and physiological conditions. The salient points of Wundt's doctrine are as follows: Apperception designates (1) either certain phenomena actually given in consciousness, or (2) a certain activity which we infer from these conscious data—i.e., a concept or category under which the phenomena are grouped. As regards the phenomena themselves, we have to note first that the different components of a given consciousness vary in prominence. Some ideas are clear, standing in the focus of attention (q.v.); others are obscure. Ideas may, then, be in consciousness and yet not be "apperceived." Furthermore, the relation is not fixed. An idea may disappear from the focus of attention and another, previously obscure, take its place. Clearness is not, like quality or extent of sensation, dependent merely upon the character of the stimulus. It is not, like intensity, which it most resembles, a function of a single idea, but attaches to a number of ideas. Now the entrance of an idea into the focus of attention is by no means a simple matter. Analysis discloses, besides the increase of the given idea in clearness, (1) a feeling of activity, (2) inhibition of other ideas, (3) strain sensations and concomitant feelings which intensify the feeling of activity, and (4) the reflex effect of (3), which intensifies the given idea. A careful examination of Wundt's writings shows that the "feeling of activity" is not ultimate and unanalyzable, distinct from either sensation or affection (q.v.), but rather a conventional term representing a complex of sensation and affection from the presence of which in consciousness we infer an activity or spontaneity. Wundt distinguishes between "active" apperception, marked by the feeling of activity, and "passive" apperception, marked by a feeling of passivity, a lessening of the intensity of the concomitant phenomena, and less clearness of the focal idea. In typical passive apperception the clarifying of the idea is determined unequivocally and immediately. In active apperception there are several rival ideas; the result is equivocal and frequently delayed. The conditions of apperception are either (1) objective, viz., (a) the intensity, and (b) the frequency of the presented occurrence; or (2) subjective, viz., (a) the nature of the immediately preceding consciousness, and (b) the individual disposition of the mind, as determined by its entire previous history.

Apperception is closely related to association. Association, according to Wundt, furnishes all the possible connections of ideas; apperception decides which of the possibilities shall be realized. Thus the idea *x* may be associatively connected with *a*, *b*, *c*, and *d*, but apperception may bring it about that, in a given case of the arousal of *x*, only *b* appears in attention. This process of choice, of the enhancement of one out of several ideas, together with the feeling of activity, differentiates apperception from asso-

ciation. Apperceptive connections themselves may be either simultaneous or successive. The former are subdivided into (a) agglutinations, (b) apperceptive fusions, and (c) concepts. (See ABSTRACTION.) The judgment is typical of the successive form of apperceptive connections.

Stout defines apperception as the "process by which a mental system appropriates a new element, or otherwise receives fresh determination." Great stress is laid upon the "preformed mental system," which is regarded as an organic whole, not (as by Herbart) a mere apperception-mass of presentations. By its reaction upon the further processes of attention, it gives us the clew to the problems of mental growth and mental organization. Stout further introduces the ideas of "negative" and "destructive" apperception. Negative apperception is a form in which the effort to appropriate a new element is unsuccessful; destructive apperception is a form in which "one system by appropriating a new element wrests it from its preformed connection with another system." In each case there results some positive effect; former systems become modified or new systems are developed.

The early experimental investigations of apperception deal for the most part with the time relations of the various factors involved; the later investigations have analyzed the conditions under which apperception occurs. Valuable results have been gained by a study of the apperception of ideas as conveyed by language (q.v.), both spoken and written.

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APPERT, à'pâr', BENJAMIN NICOLAS MARIE (1797-c.1847). A French philanthropist and educator, born in Paris. He introduced into several military schools a system of mutual instruction, and in 1820 founded and conducted gratuitously a school for prisoners at Montaigu. He was suspected of having aided the escape of two prisoners and was himself confined in the military prison. Here he made a study of the moral and physical circumstances of the prisoners, and after his liberation he devoted much time to the study of schools, prisons, and hospitals and published his researches in his *Journal des Prisons* (1825-30) and in a four-volume work called *Bagnes, prisons, et criminels* (1836). After the Revolution of 1830 he was employed by Louis Philippe to superintend the measures taken for the relief of the indigent classes. He also wrote a work entitled *Dix ans à la cour du roi Louis-Philippe* (1846). In his *Conférences contre le système cellulaire* he strongly opposed the system of solitary confinement. It is said that he taught at least 100,000 soldiers to read and write. He has been criticised for one-sidedness, but seems to have been a sincere and warm-hearted philanthropist.

APPERT, FRANÇOIS (?-1840). A French technologist, the brother of Benjamin Appert.

He invented (1804) a method of preserving food without the use of chemicals. His method is fully described in his work on the *Art of Preserving Animal and Vegetable Substances* (5th ed., 1834; Eng. trans., London, 1811). It is the well-known method of placing the article of food to be preserved in a can, after heating it, and then sealing the can hermetically. The publication of his method brought Appert a prize of 12,000 francs from the French government.

AP'PETITE. See DIGESTION, ORGANS AND PROCESS OF, IN MAN.

AP'PIAN. See APPIANUS.

APPIANI, ä'pê-ä'nê, ANDREA (1754-1817). An Italian painter, born at Milan. His artistic training consisted in extensive studies of antique sculpture and of the Renaissance masters, and he is the chief master of the classicists in Italy. He first acquired fame by the frescoes of the palace of Monza and of the cupola of Santa Maria presso San Celso (Milan) and was appointed first painter of the court of Italy by Napoleon. He portrayed the Emperor, the Viceroy of Italy and his family, and frescoed several rooms of the royal palace at Milan. After his patron's fall he was afflicted by poverty and illness and died of apoplexy. By reason of the charm of his style he was called the "Painter of the Graces." He excelled all painters of his day in fresco; his oil paintings, to which an entire room of the Brera Gallery is devoted, are mediocre.

AP'PIA'NUS (Gk. Ἀππιανός, *Appianos*). A native of Alexandria, who lived during the reigns of Trajan, Hadrian, and Antoninus Pius. He was the author of a Roman history in Greek, entitled Ῥωμαϊκά (*Rōmaïka*), in 24 books, of which only 11 are extant in complete or fairly complete form. It was not remarkable for anything except the plan on which it was written. Instead of proceeding to exhibit chronologically the growth of the Empire, from its rude beginning on the Palatine Hill to the period when its power held the whole world in awe, which is at once the popular and the philosophical method, he divided his work into ethnographic sections, recording separately the history of each nation up to the time of its conquest by the Romans. First in order were the books devoted to the old Italian tribes; then came the history of Sicily, Spain, Hannibal's wars, Libya, Carthage, and Numidia, Macedonia, Greece proper and its colonies, Syria, Parthia, the Mithridatic wars, the Roman civil wars, wars in Egypt, and the imperial wars in Illyria and Arabia. The more complete extant portions deal with Spain, Hannibal, Carthage, Syria, Mithridates, the Roman civil wars, and Illyria. As an historian, Appianus is a mere compiler and not very accurate in his compilation. His geographical knowledge in particular is singularly deficient, considering the age in which he lived. The best edition is that of L. Mendelssohn (Leipzig, 1879-81), resting in large part on the great edition of Schweighäuser (q.v.) in three volumes (1785); translated by H. White (New York, 1899): the translator's preface contains much valuable matter, especially on the manuscripts of Appian.

AP'PIAN WAY (Lat. *Via Appia*). A Roman road, well named by the poet Statius *regina viarum* ('the queen of roads'), the oldest and most celebrated of the Roman roads. It was begun by Appius Claudius Cæcus while

ensor (312 B.C.). It led from the Porta Capena in the Servian wall at Rome in a southerly direction to Capua, passing through Tres Tabernæ, Appii Forum, Terracina, etc. Subsequently it was carried on to Beneventum, Tarentum, and thence to Brundisium. It was carefully built, though the pavement of large hexagonal blocks, principally lava, on a firm foundation and strengthened by cement, is probably not the original bed. From Rome Terracina the course is nearly straight, in spite of the steep grades in crossing the Alban Mountains and the difficulties of the Pontine marshes. Near Rome the road was lined with tombs, of which many remains can still be seen. The most remarkable of these tombs are those of the Scipios and of Cæcilia Metella. The ancient pavement, in good repair, is still in use in places.

AP'PIA VIA. See APPIAN WAY.

AP'PIUS, MARKET OF. See FORUM APPII.

AP'PIUS AND VIRGIN'IA. A Roman legend of an attempted corruption of maidenly virtue, which has since proved a fertile subject for romancers. The story was originally told by Livy. It is repeated in the *Pecorone di Giovanni Fiorentino*, published in 1378, and again in *Painter's Palace of Pleasure*, in 1566. Modifications of it occur in the *Roman de la Rose* and in Gower's *Confessio Amantis*. "The Doctor" of the *Canterbury Tales* also repeats it in substance. The title has headed no less than three English plays: an early tragical comedy, by an unknown author signing himself R. R., a tragedy by Webster, printed in 1654, and a tragedy by Dennis, in 1709. It is also the subject of a poem, "Virginia," by Macaulay. For other plays on the same subject, see VIRGINIUS.

APPIUS CLAU'DIUS CRAS'SUS. A Roman decemvir (451-449 B.C.). While the other decemviri (q.v.) were engaged in repelling an incursion made by the Sabines, Appius Claudius and his colleague Oppius remained in Rome, with two legions to maintain their authority. Meanwhile Appius Claudius had been smitten by the beauty of Virginia, daughter of a respected plebeian named Lucius Virginius, who was abroad with the army. By force and stratagem, representing that she was the born slave of Marcus Claudius, one of his clients, Appius Claudius gained possession of the girl. Lucius Icilius, who was betrothed to Virginia, and Numitorius, her uncle, threatened to raise an insurrection against the decemviri. Virginius, hurriedly recalled from the army by his friends, appeared and claimed his daughter; but, after another mock trial, she was again adjudged to be the property of Marcus Claudius. To save his daughter from dishonor, the unhappy father seized a knife and slew her. The popular indignation excited by the case was headed by the senators Valerius and Horatius, who hated the decemvirate. The army returned to Rome with Virginius, who had carried the news to them, and the decemviri were deposed. Appius Claudius died in prison by his own hand (so Livy states), or was strangled by order of the tribunes. His colleague, Oppius, committed suicide, and Marcus Claudius was banished.

AP'PLE. The name applied to a tree belonging to the rose family of plants, as well as to its fruit. The common apple is known botanically as *Pyrus malus*; the crab apples belonging to *Pyrus baccata*. All the cultivated

apples of the world have come from these two forms. The fruit of the apple is a *pome*, consisting of a thickened fleshy portion, resulting from the development of the calyx, inclosing the horny cells forming the core and covering the true seeds.

The common apple, *Pyrus malus*, has been in cultivation since prehistoric times. Charred remains of the fruit have been found in the mud of the lakes inhabited by the Lake Dwellers, and according to De Candolle, the tree was probably indigenous to Anatolia, the south of the Caucasus, and northern Russia, and its cultivation began at a very early date. The Siberian Crab, *Pyrus baccata*, is a native of the north, and is of great importance to fruit-growers not only on account of its own hardy and resistant character, but also because it transmits much of its hardiness to its crosses with *Pyrus malus*, thus producing a fruit of good quality that can endure northern climates. Besides these European apples, North America has several wild species. Among these, the prairie apple, *Pyrus ioensis*, is perhaps the most promising from a horticultural standpoint, because crosses between it and *Pyrus malus* (to which class the so-called *Pyrus soulardii* undoubtedly belongs) are already valuable. The eastern wild apple, *Pyrus coronaria*, is of little value for its fruit, but its bloom is beautiful. China and Japan have native apples which are of little economic importance, but are interesting in that they carry the genus through the north temperate zone around the world.

Economically the apple is the most important fruit of temperate regions. It is grown over a wide area, prospering as far north as Scandinavia and as far south as the southern mountain districts of the United States. It has, moreover, been carried into the southern hemisphere, and now, with rapid ocean transit, New Zealand and Tasmanian apples are annually offered during April and May in the markets of London and San Francisco.

North America is the leading apple-growing region of the world. Apples are raised on a commercial scale east of the Rocky Mountains from Nova Scotia south to northern Georgia and west to Wisconsin, Iowa, Nebraska, Kansas, and Oklahoma. In recent years the industry has developed rapidly in Colorado, Utah, Idaho, Montana, British Columbia, Washington, Oregon, and California. These several regions produce an annual aggregate product of 50,000,000 barrels. The greater portion of this yield finds a ready market within the domain of North America; but an increasing share of the crop is being annually exported, mainly to Liverpool, London, and Glasgow. Germany and the Mediterranean countries may be counted upon as a future market for American apples.

The apple is propagated both by budding and by grafting the desired sort on young seedling trees, which are usually grown from seeds obtained from apple pomace at the cider mills. (See BUDDING; GRAFTING.) Such seeds give a progeny variable both in hardiness and in habit of growth, and are therefore less desirable for stocks than seedlings grown from seeds of the wild *Pyrus malus* of Europe. Budded trees are preferred by most growers and nurserymen in the eastern parts of the United States; largely because of their quick growth, which shortens the time during which money invested is non-productive. The root-grafted tree is preferred

by planters in the northwest; such trees form roots from the scion, if a short piece-root is used. This, sooner or later, produces a tree on its own root, which in turn eliminates the uncertainty of the seedling root and, when "iron-clad" scions are used, gives a perfectly hardy tree. Grafting is again important for the purpose of converting bearing trees, of several years' standing, from one variety to another.

Dwarf apples are grown as espaliers in parts of England. The dwarf trees are obtained by grafting the desired variety on Paradise or Doucin stocks. These are dwarf forms of *Pyrus malus*. New varieties of apples are obtained by sowing the seeds of cultivated sorts. Seeds from such fruits are more likely to give variable offspring than those from wild trees. Frequently thousands of seedlings are grown without producing one valuable tree. Apple trees grow large and endure many years. In planting an orchard, therefore, the trees should be given ample room; 40 feet each way is close enough in New York and the New England States, where the trees grow largest. Farther south, where the trees do not attain great size and are shorter-lived, 33 to 35 feet apart each way is not too close. In the Northwest trees should be planted even closer than this, for there they are liable to injury from sun-scald and wind. Closely planted and low-headed trees serve as a mutual protection. Soils for the apple which have given the best crops and have produced longest-lived trees are chiefly composed of clay or clay-loam impregnated with gravel. Such land, situated so as to afford good air as well as land drainage, produces more regular crops of highly colored and highly flavored fruits than lower and heavier lands. Atmospheric drainage is one of the best material safeguards against late spring frosts, and good land drainage assures a congenial soil for the plant.

The greatest demand in the ripening of the fruit and seed is made upon potash and phosphoric acid. These are the two ingredients most frequently needed by the orchard. If nitrogen be lacking, it can be made up by growing a leguminous crop, such as Canada peas, cow-peas, or beans, upon the soil and turning it under.

Cultivation. Good cultivation is an important part of orchard management. In favorable localities, cultivated and fertilized, shallow-rooted crops may be grown between the rows of trees for a few years without detriment to the orchard, but the orchard should not be used as a pasture lot or as regular farm land. Cultivation should be done early in the season to stimulate early growth, but discontinued by July 15 in the United States in order that growth may be checked and the wood mature properly to insure hardiness during the winter and a crop the following season. Sowing a leguminous cover crop at this time, to be turned under in the spring will facilitate the maturing process, add to the supply of nitrogen, and keep the soil in good physical condition. Another essential is proper pruning. This must be modified to suit the variety, locality, and purpose for which the tree is grown. In general, a low head, wide-spreading branches evenly disposed about the trunk and at different heights, are desirable ends. Thinning the fruit shortly after the June drop materially increases the number of fancy apples, reduces the culls, and increases the resistance of the remaining crop to windfall.

APPLES



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1 HYSLOP CRAB
2 RED ASTRACHAN
3 YELLOW BELLFLOWER

NATURAL SIZE
 $\frac{3}{4}$ NATURAL SIZE
 $\frac{2}{3}$ "

4 BEN DAVIS
5 NORTHERN SPY
6 HUBBARDSTON

$\frac{3}{4}$ NATURAL SIZE
 $\frac{2}{3}$ "
 $\frac{3}{4}$ "

Harvesting and Storage. The work of Powell, Fulton, and others has shown that apples should be fully grown and highly colored to give them the best commercial and keeping quality. When harvested in that condition, they are less likely to scald in storage and are worth more money than when picked in a greener condition. Overgrown apples, such as those produced on young trees, are an exception and require earlier picking. After the fruit is picked, the ripening processes continue much more rapidly at the same temperature than when the fruit is left on the tree. Therefore after picking, the fruit should be taken at once to the storage room. Any bruising or rough handling hastens decay. The fruit keeps best and longest if stored at a temperature of 31° to 32° F. Early apples keep best in small packages which cool down rapidly in storage. Wrapping each fruit with unprinted newspaper prolongs the keeping quality and reduces the amount of decay. Wrapping is commercially profitable only with the highest dessert quality of fruit or for home use. Winter apples keep satisfactorily in barrels.

Varieties. Each section of the world possesses a certain number of varieties which are peculiarly suited to its soil and climate. When apple culture is to be extended to a new region, the problem to be solved is to ascertain which varieties are best adapted to the conditions prevailing in that region. In the United States the varieties held in highest favor by the inhabitants of any given locality have usually proved safest to plant for commercial purposes.

Uses. The apple is used most extensively for cooking and for eating out of hand. It is also employed for cider making and vinegar making. For these purposes smaller or inferior fruits are usually taken. Brandy and other beverages are made from the juice also. Large quantities of the fruit are now dried in evaporators, the product being quite extensively exported to European countries.

Apple Diseases. The apple is subject to a number of fungous diseases, the more important of which are rust, scab, bitter or ripe rot, canker, and crown gall. The rust is due to the heteroecious fungus *Gymnosporangium macropus*, the cause of the well-known galls on cedar or juniper trees. These gall-like growths ripen in the spring of the year and present horn-shaped orange-colored masses filled with spores. The spores are blown to apple trees and cause the rust of the leaves. This generation of the fungus has been given the name *Ræstelia pyrata*. In addition to the leaves the fruits are attacked, often severe losses occurring. There is some evidence that the mycelium of the fungus may find its way into the leaf buds of the apple and infect the next crop without having to depend on the alternate generation. Destroying all cedar trees and thoroughly spraying the apple trees with Bordeaux mixture (see FUNGICIDE) will hold the disease in check. Some other species of *Gymnosporangium* are associated with apple rust, and a similar disease of pears is common. The apple scab is caused by the fungus *Venturia pomi*, formerly known as *Fusicladium dendriticum*, its conidial stage. Leaves and fruit of both the apple and pear are subject to attack of this fungus. Upon the fruit dark circular spots are formed, and often a number of spots run together and the fruit cracks, exposing the hard brown tissue beneath.

Upon the leaves the spots are somewhat similar to those on the fruit, but they are lighter in color. The affected leaves are crumpled, ragged, and finally fall off. This is one of the most serious fungous diseases to which the apple and pear are subject. Varietal differences in susceptibility to scab have been noted in some localities. Spitzenberg, Fameuse, Fall Pippin, and Harvest apples are especially subject to disease, while Ben Davis, King, Fallwater, and many others are less seriously affected. This disease and the losses occasioned by it may to a large degree be prevented by thorough spraying with Bordeaux mixture, lime-sulphur, or other fungicide, three to five applications being given the trees at intervals of about 10 days, beginning at the time of the swelling of the buds. The bitter or ripe rot is due to the fungus *Glomerella rufomaculans*, formerly known as *Glæosporium fructigenum*. This fungus is widely distributed and often causes great loss to fruit-growers. Upon the fruit it produces a soft rot, in later stages often becoming corky, dry, and dark. In advanced stages the fruit is shriveled and dried up. The name "bitter rot" is derived from the bitter flavor of the fruit often associated with this disease. The fungus also produces cankers on the limbs of the trees, from which spores spread to the succeeding crop of apples. All cankered limbs should be cut out, mummied fruit gathered and destroyed, and the trees sprayed as above. There are a number of diseases of apple trees called canker. One common in Europe, due to *Nectria ditissima*, has recently been found in the United States. The pear blight organism, *Bacillus amylovorus*, has lately been found to cause cankers on limbs and trunks of pear and apple. *Nummularia discreta* causes what is known as Illinois canker. The so-called New York apple tree canker is due to *Sphæroopsis malorum*, a fungus that also causes a black rot of the fruit. The Oregon canker is due to *Neofabræa malicorticis*. These fungi gain entrance through wounds, destroying the bark and later the underlying wood. Where the attack is slight, cutting out the affected areas, the wound to be disinfected, may be followed, but where severe the trees should be cut and burned, as they are a menace to other trees. Spraying may be beneficially employed in connection with the pruning. The crown-gall of apples, due to *Bacterium tumefaciens*, is found upon the trunk or larger roots just below the surface of the ground. Galls are found elsewhere, but they usually are much smaller. Hard and soft galls are met with, and a disease known as hairy root is believed by some to be a form of crown-gall.

Insect Pests. A large number of insects injuriously affect apple trees and fruit, among which certain scales, beetles, and moths are preëminent. **Beetles.**—Wood-boring beetles are very destructive, especially the round-headed borer (*Saperda candida*) (see Plate of BEETLES), and the flat-headed borer (*Chrysobothris femorata*). The former is one of the worst enemies of apple culture in the United States; and like the others does its damage as a grub, born from an egg laid in the bark, where it bores into and feeds upon the sapwood. A special description of these beetles and other apple-boring beetles, with advice as to control of similar pests, is given in *Entomological Circular No. 32*, and *Bulletin 22*, of the Bureau of Entomology, United States Department of Agricul-

ture. Various root borers and fruit borers are also to be feared here and in foreign lands, especially in Australia, where also a harlequin fruit bug is dangerous. The plum curculio over a great deal of its range is easily second in importance to the codling moth. *Moths*.—Important enemies are to be found among the Lepidoptera, which place eggs on the newly set fruit, whence caterpillars develop within the developing fruit, or which destroy the leaves. The codling moth, tent caterpillar, cankerworms (q.v.), and lesser apple worm are prominent among these. In Europe the principal damage is done by a small white, black-spotted ermine moth (*Hyponomeuta padellus*), and in Japan by a moth (*Laverna herellera*), whose larvæ live in the core of the fruit. The worst American insect of this class is the codling moth, which may be treated by spraying with an insecticide (q.v.). Paris green and arsenate of lead are most frequently used for this purpose. *Scales*.—The San José and oyster-shell scales, which attach to the bark and suck the sap, are two of the most serious enemies of the tree. *Aphids*.—Several species, especially the woolly aphis, are troublesome pests. A calendar showing the kind and approximate time of spraying to check insect pests and diseases is given below:

Directions for making and applying these sprays may be found in the article FUNGICIDE.

Fossil Forms. The genus *Pyrus* is known in a fossil state from the Cretaceous of North America and the Tertiary of North America and Europe.

Consult: J. A. Warder, *American Pomology, Part I, Apples* (New York, 1867); Bailey, *Field Notes on Apple Culture* (New York, 1886); Report of the Kansas State Horticultural Society, *The Apple* (Topeka, 1898); Reports of United States Department of Agriculture, Division of Pomology (Washington); S. A. Beach, N. O. Booth, and O. M. Taylor, *The Apples of New York* (2 vols., Albany, 1905); F. A. Waugh, *The American Apple Orchard* (New York, 1908); L. Woolverton, *The Canadian Apple Grower's Guide* (Toronto, 1910); S. W. Moore, *Practical Orcharding on Rough Lands* (Akron, Ohio, 1911).

APPLE, HENRY HARBAUGH (1869—). An American clergyman and educator, born at Mercersburg, Pa. He graduated from Franklin and Marshall College in 1889 and from the Theological Seminary of the Reformed Church in the United States in 1892. Ordained to the ministry of his denomination, he became pastor of St. John's Church in Philadelphia (1892)

SPRAYING CALENDAR FOR DISEASES AND INSECT PESTS OF THE APPLE

NAME OF TROUBLE	I TREATMENT	II TREATMENT	III TREATMENT	IV TREATMENT	V TREATMENT
Scab.....	Copper sulphate solution or lime-sulphur solution before buds break.	Bordeaux mixture or lime-sulphur solution when leaf buds are open but before flower buds expand.	Bordeaux mixture or lime sulphur solution as soon as blossoms have fallen.	Bordeaux mixture or lime sulphur solution 10-12 days after (III).	Repeat (III) once or twice at intervals of two weeks.
Rust	" "	" "	" "	" "	" "
Brown spot.....	Bordeaux mixture at same time as II treatment for apple scab.	Same as III for apple scab.	Same as IV for apple scab.		NOTE—This disease is liable to cause loss of foliage near harvest time. Ammoniacal copper carbonate should be used for late treatments. Lime sulphur has usually less caustic effect on leaves than Bordeaux mixture.
Bitter rot	Bordeaux mixture or lime-sulphur mixture about 8 weeks after blooming.	Bordeaux mixture or lime sulphur solution 10 days to 2 weeks later.	Ammoniacal carbonate of copper or lime-sulphur mixture as substitute for Bordeaux 2 to 3 weeks after (II).	Repeat (I) if second brood is troublesome.	
Tent caterpillar ...	Arsenate of lead or Paris green in II treatment for scab.	Repeat (I) in 8 to 10 days.			
Spring cankerworm	Arsenate of lead or Paris green before blossoms open or as soon as they fall.				
Codling moth	Same as III treatment for scab, with lead arsenate added.	Repeat (I) before blossom buds open.	Repeat (I) 8 to 9 weeks after petals fall.		
Plum curculio	" "				
Bud moth	Arsenate of lead or Paris green as soon as tips of leaves show in bud.				
San José scale.....	Winter treatment with strong lime-sulphur mixture or late winter application of a miscible oil.				
Oyster-shell scale..					

and of Trinity Church in York, Pa. (1898). In 1909 he was chosen president of Franklin and Marshall College. Besides holding official position in several other denominational organizations, he was, in 1905, president of the Potomac Synod of the Reformed church.

APPLE BRANDY. Brandy produced by distilling the fermented juice of apples. It was at one time extensively produced in New Jersey, where it was known as "Apple-jack," and on account of its ardent and intoxicating qualities as "Jersey Lightning." The process of manufacture is similar to that employed in distilling the juices of other fruits, which will be found described in DISTILLED LIQUORS.

APPLEBY, WILLIAM REMSEN (1865—). An American metallurgist and educator, born in Hoboken, N. J. He graduated from Williams College in 1886 and studied at the Columbia School of Mines in 1886-87. During the two following years he was assistant analytical and pharmaceutical chemist in the New York College of Pharmacy. He became professor of mining and metallurgy at the University of Minnesota in 1890, and in 1891 professor of metallurgy and dean of the School of Mines. He was made a member of several scientific societies.

APPLE OF DISCORD. A golden fruit bearing the inscription, "For the fairest," which was thrown by Eris, or Discord, into the midst of the company at the marriage of Peleus and Thetis. The prize was claimed by Juno, Minerva, and Venus, and was adjudged to Venus by Paris, who was called in to make the award. The decision brought about the Trojan War.

APPLE OF SOD'OM. See SODOM, APPLE OF.

APPLE SHELL, or APPLE SNAIL. A large, globose, amphibious mollusk of the warmer parts of Africa and America, of the family Ampullariidæ. They inhabit marshes, attaching their large eggs to the leaves of water plants, where they are searched for and devoured by birds. They possess both lungs and gills, and in some regions use both these organs in rapid alteration, as was observed by Semper (*Animal Life*, p. 191, New York, 1881) in the Philippines. "The ampullaria," he remarks, "lying not far from the surface of the water, protrudes above it a breathing siphon, and inhales air through it; then it closes its lungs, reopens the siphon, and admits a stream of water through it into the branchial cavity." The shells are large, thin, brilliantly striped (see Colored Plate of SNAILS), and are known in South America as idol shells. See Plate of ABALONE, ETC.

APPLETON. A city and the county-seat of Outagamie Co., Wis., 100 miles by rail northwest of Milwaukee, on the Chicago and Northwestern, and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, E 4). It is situated on the falls of the Fox River, which by a series of dams is navigable for steamboats and, with a fifty-foot fall, supplies extensive water power for various manufactures, chief of which are paper and pulp. The dairying interests also are important. Appleton is the seat of Lawrence University, a Methodist Episcopal institution, organized 1847, and has two libraries and three hospitals. The city was settled in 1848 and incorporated as a village in 1853 and as a city in 1857. It has adopted the commission form of government. Pop., 1890, 11,869; 1900, 15,085; 1910, 16,773.

APPLETON, CHARLES EDWARD (1841-79).

An English editor. He was born at Reading, and was educated at St. John's College, Oxford, and in Germany. He is remembered chiefly as the organizer of the movement for the "endowment of research," and as founder (1869) and editor (1869-79) of the *Academy*, the distinguishing characteristic of which was its signed articles. Consult John H. Appleton and A. H. Sayce, *Life and Literary Relics* (London, 1881).

APPLETON, DANIEL (1785-1849). An American publisher. He was born in Haverhill, Mass.; first engaged in the dry-goods business there and in Boston, and in 1825 removed to New York to follow the same business. He gradually combined the importing of books with the dry-goods trade and finally devoted himself entirely to the book business, publishing his first book in 1831. The firm which he established, known ever since as D. Appleton and Company, is continued by his descendants.

APPLETON, GEORGE SWETT (1821-78). An American publisher, the third son of Daniel Appleton. He was born in Andover, Mass., studied at Leipzig, and for a number of years was a publisher and bookseller in Philadelphia. In 1849, with three brothers, John, William, and Sidney, he succeeded to his father's publishing business in New York. He was a scholar and art connoisseur, becoming literary adviser to the firm. *Appleton's Art Journal* and the *Popular Science Monthly* were planned by him.

APPLETON, JAMES (1786-1862). An American temperance reformer, born at Ipswich, Mass. When a young man he served in the Massachusetts Legislature. He fought as colonel of militia in the War of 1812 and was promoted to be a brigadier-general. Having removed to Maine, he was elected to the Legislature of that State in 1836. In 1837 he presented to the Legislature a report in which were advanced the principles that afterward became the basis of the Maine liquor law.

APPLETON, JESSE (1772-1819). An American author and educator. He was born at New Ipswich, N. H.; graduated at Dartmouth College in 1792, and was ordained pastor of the Congregational Church, Hampton, N. H., in 1797. He taught in several New England academies and from 1807 to 1819 was president of Bowdoin College. President Franklin Pierce was his son-in-law. *The Works of Jesse Appleton* were published in two volumes in 1836, by Prof. A. S. Packard. Consult: biographical sketch by Rev. Dr. Nicholls in a collection of Appleton's addresses (1820); memoir by Rev. B. Tappan prefixed to *Sermons and Lectures of Jesse Appleton* (1822).

APPLETON, JOHN (1815-64). An American diplomatist. He was born at Beverly, Mass., and graduated at Bowdoin College in 1834. In 1838 he was editor of the *Eastern Argus*, published in Portland, Me. Seven years later he became chief clerk of the Navy Department at Washington; then he held a corresponding position in the State Department. He was *chargé d'affaires* to Bolivia (1848-49), a member of Congress from 1851 to 1853, secretary of legation in London (1855-56), Assistant Secretary of State (1857), and Minister to Russia (1860-61).

APPLETON, JOHN HOWARD (1844—). An American chemist. He was born at Portland, Me., and received his education at Brown University, where he became instructor in 1863 and professor of chemistry in 1868. He wrote a

series of popular text-books that are well known for their attractive form and clearness of exposition. The series includes: *The Young Chemist* (1878); *Qualitative Chemical Analysis* (1878); *Quantitative Chemical Analysis* (1881); *Chemistry of the Non-Metals* (1884); *The Metals of the Chemist* (1891); *Chapters on the Carbon Compounds* (1892); *Lessons in Chemical Philosophy* (2d ed., 1890); *The Assay-Book for Students* (1906).

APPLETON, NATHAN (1779-1861). An American merchant, born at New Ipswich, N. H. He was in partnership with his brother Samuel in Boston. With others, he started the first power-loom for weaving cotton in the United States. He was one of the Merrimac Company whose enterprise founded the city of Lowell (q.v.). He served several terms in the Massachusetts Legislature; in 1830 and in 1842 he was a member of Congress, where he was one of the prominent advocates of a tariff for protection. He published (1858) *Remarks on Currency and Banking*. Consult R. C. Winthrop, *Memoir of Nathan Appleton* (Boston, 1861).

APPLETON, SAMUEL (1766-1853). An American merchant and philanthropist, brother of Nathan Appleton, born at New Ipswich, N. H. He passed his boyhood on a farm. In 1794 he and his brother Nathan went into the English trade in Boston, and afterwards added cotton manufacturing, in which they made a fortune. He retired from active business in 1823 and devoted his entire income to benevolent and scientific purposes, for which he bequeathed \$200,000. Consult the Memoir in *Massachusetts Historical Society Proceedings* (1855-58).

APPLETON, THOMAS GOLD (1812-84). An American poet, artist, and scholar, patron of art and science, born in Boston. He was a brother-in-law of the poet Longfellow and was a noted wit and raconteur. He founded the Boston Literary Club. His verses are collected in *Faded Leaves*; his prose in *A Nile Journal* (1876); *Syrian Sunshine* (1877); *Windfalls* (1878); *Chequer Work* (1879). *A Life and Letters of Thomas Gold Appleton* was edited by Susan Hale (1885).

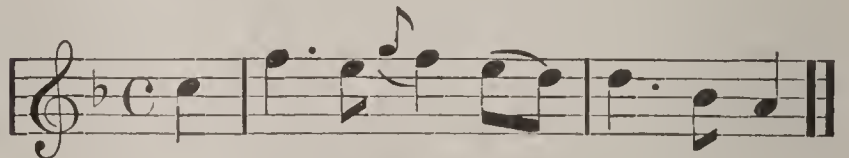
APPLETON, WILLIAM HENRY (1814-99). An American publisher. He was born at Haverhill, Mass., and studied in secondary schools. In 1848 he became the senior member of the firm of D. Appleton and Company, and for 60 years was prominent in the book trade. He was active in the struggle for an international copyright. Among the publications brought out by him were *The New American Cyclopædia* (1858-63); *Webster's Spelling-Book* (1858); cyclopædias of *Drawing* (1857), *American Biography* (1887-1900), *Applied Mechanics* (1897), and an *Annual Cyclopædia* (1885-1903). In 1872 he wrote *Letters on International Copyright*.

APPLIQUÉ, à'plē'kâ' (Fr. *appliqué*, from *appliquer*, to apply). In architecture and decoration, any design or feature having the appearance of being independently made and applied or attached to the surface of the object it is intended to adorn. The so-called "strap work" of the English Elizabethan and Jacobean styles (1558-1625) is sometimes so designated because it imitates certain woodwork and metalwork of Germany and the Netherlands, in which jigsaw or cut-out patterns on metal, ivory, or wood, were applied to furniture, jewel-boxes, book-covers, etc., and secured by nails or rivets with decorative heads. Such façades as have this ap-

pearance of having been brought from elsewhere and fastened to the buildings they decorate (a fashion of design usually open to severe criticism) are sometimes called *appliqué* façades, sometimes frontispieces. In textile art *appliqués* of lace or of some contrasting material cut into decorative patterns are very common decorative devices.

When an applied ornament, however, is *sunk into* the body of the decorated object, it ceases to be *appliqué* and becomes an inlay. See ELIZABETHAN ORNAMENT.

APPOGGIATURA, à-pöd'jä-tōō'râ (It. from *appoggiare*, to lean, rest). One of those melodic ornaments which are regarded as accessory notes having no time value and which are printed in small characters. There are two distinct varieties of the *appoggiatura*, the long and the short. The *Long Appoggiatura* was a device of the early classic composers, who disliked to use unprepared suspensions and invented the idea of covering or disguising them by writing them in small notes, as mere embellishments of the melody. This unhappy inspiration has been a source of needless trouble to the music student, who is obliged to learn various rules for the proper execution of this device, in which a note is given one value in writing and another in performance. The time of an *appoggiatura* is taken from that of the following or "principal" note, and the *appoggiatura* note is marked with its actual value, while the principal note is marked with the value which both together have. The general rule for its execution is that the *appoggiatura* is played exactly as if it were written as a large note, and the following note is given what remains of its face value, as shown in the following examples:




WRITTEN THUS.



PLAYED THUS.

The *Long Appoggiatura* always occurs *on* the beat, and has therefore the accent which the principal note *appears* to have. When written before a chord, the *appoggiatura* only delays the note to which it belongs.

This device has been entirely discarded by modern composers, and Dr. Hugo Riemann wisely suggests that in new editions of the old works it should be removed, and the notes rewritten in the form in which they are to be played.

The *Short Appoggiatura*, now commonly called a grace-note, also originated in the early classic period. It is written as an eighth note, with a stroke through the stem,  and is played so quickly that it really has no perceptible time-value. Opinions differ as to whether it should be played on the beat or before it, the difference being merely a question of accent. The classic tradition and conservative opinion demand its execution on the beat, but many musicians of the present day consider it more graceful and more truly ornamental if played without accent,

before the beat. The final decision must be left to the taste of the performer.

APPOINTMENT (Fr. *appointment*). In English and American law, the act of vesting an estate in one's self or in another, under a power or authority so to do, conferred by the owner of the land. Such powers are created by deed or will, and must be exercised in the manner prescribed by the instrument conferring the power, but only by an instrument competent to create or transfer an interest in real estate. See **POWER OF APPOINTMENT**.

Appointment to Office is the formal designation, by one in whom the authority has been lawfully vested, of a person to hold a public office or perform a public duty. The term is not properly applicable to the choice of an officer by public election. Usually a certificate, or commission, signed by the appointing officer, is required by law, and this becomes a public record and constitutes the appointee's evidence of title to the office, and his justification for exercising its powers, without which such exercise constitutes usurpation. As to the nature of the rights conferred by an appointment, see **OFFICE**, and articles and authorities there referred to; also **DE FACTO**.

APPOLD, ăp'old, JOHN GEORGE (1800-65). An English inventor. His chief inventions were an improvement of the centrifugal pump, a process for dressing furs, and an apparatus for paying out submarine telegraph wire, which was very useful in laying the Atlantic cable.

APPOMATTOX COURT-HOUSE. A village in Appomattox Co., Va., 23 miles east of Lynchburg, on the Norfolk and Western Railroad. The village is the seat of an agricultural school and a government experiment station. Here General Lee surrendered the army of Northern Virginia to General Grant, April 9, 1865, and virtually ended the Civil War. Pop., about 500.

APPONYI, ăp'pō-nyī, ALBERT, COUNT (1846—). Son of György, and a prominent member of the Hungarian Diet. He was originally the leader of the Conservative "National Party," but in 1899 joined the Liberal Party and in 1901 was elected president of the Chamber of Deputies. He resigned in 1903, announced his secession from the Liberal Party, and in 1904 reorganized the National Party. With his followers he joined the coalition which brought about the fall of the Tisza cabinet in 1905. In April, 1906, he became Minister of Education in the compromise Wekerle cabinet. He visited America in 1904 as a delegate to the World Peace Conference at St. Louis, and again in 1911, when he lectured in the interests of International Peace. He published *Esthetics and Politics, the Artist and the Statesman* (1895) and *A Brief Sketch of the Hungarian Constitution and of the Relation between Austria and Hungary* (1908).

APPONYI, GYÖRGY (George), COUNT (1808-99). A Hungarian statesman. He was a member of the Presburg Diet of 1843-44, and Hungarian Court Chancellor in 1847. He was the leader of the Conservative Party, and opposed the revolutionary movement of 1848-49. He lived in retirement until 1859, when he became a member of the Austrian Reichsrath, where he displayed great ability as a leading advocate of various plans for restoring the Constitution to Hungary. In 1861 he opened the Diet at Budapest as Royal Commissioner and presided over the sittings of the Upper House.

He was most influential in bringing about the transformation of Austria-Hungary on the present dual basis.

APPOR'TIONMENT (Lat. *ad*, to + *portio*, part, share, portion). A partition and readjustment of legal rights or obligations to conform to a change in the relations of the parties thereto, and to adjust their respective interests in the subject-matter affected by the change. Apportionment is of frequent occurrence in the law, and may conveniently be considered, first, with reference to the division of claims, or rights, and, second, with reference to the division of obligations, or burdens.

Apportionment of rights occurs where a person having an interest in land or a contract right, entitling him to the use or profits of the land or to payments of money, parts with a share or portion of such right or interest to another. Thus, if the owner of land which is subject to a lease at a fixed rent, sells a portion thereof, the purchaser is entitled to have the entire rent apportioned so that he shall receive the share due from the parcel of which he has become the owner. So, also, apportionment of rent takes place where an entire tenement or estate is partitioned among tenants in common, or passes by will or otherwise to several persons in parcels. Again, if the owner of land under cultivation, for the benefit of such land and of every part of it, enjoys an easement or profit *à prendre* in the land of another, as to take water for irrigation, or manure or seaweed for fertilizing it, a conveyance of a part of his land carries with it a right to a proportionate enjoyment of such easement or profit. This will, of course, be true only in cases where the right so claimed and enjoyed is apportionable or divisible in its nature. A right of way or a right to pasture one's cattle on a neighbor's land would not ordinarily be apportionable, though it is said that a right to pasture a certain number of cattle may be apportioned. The foregoing are all cases of apportionment "in respect of the estate or interest enjoyed" and present no great difficulty. But where the apportionment claimed is "in respect of time," as where the new right accrues between fixed periods of payment, the law is not so simple or consistent. At common law, rents, annuities, dividends, and similar payments falling due at fixed periods were not deemed apportionable in respect of time. That is to say, if an annual rent or a dividend were due on the first day of January, a conveyance of the land or of the corporate shares on the 31st of December would carry with it the entire rent or dividends. No part of it being due until the whole was payable, it was not considered capable of being apportioned. Interest on money loaned was an exception, as in theory of law interest was earned—i.e., accrued—from day to day (*per diem in diem*), notwithstanding the fact that by agreement of the parties the payment was postponed to a fixed date. The inequitable operation of this rule regarding fixed payments and the inconveniences resulting from it have brought about a general change in the law, by statute, both in England and in the United States, and it is now provided that all rents, annuities, dividends, and other periodical payments in the nature of income, are to be considered as accruing from day to day and to be apportionable in respect of time accordingly. At the present time the question of the appor-

tionment of fixed payments presents itself most frequently in connection with the respective claims to income of life tenants and remaindermen, or of the executor of a deceased testator and the person entitled under his will to corporate stocks left by him. The calculation of the respective shares of the parties is sometimes intricate and difficult, depending upon tables of longevity, but the principles governing their interests are as simple as they are just and convenient.

Apportionment of obligations depends on very different principles from those which result in apportionment of rights or claims. Indeed, it may be asserted, as a general proposition, that burdens are not apportionable. A tenant cannot, by alienating a portion of his tenement, relieve himself of any part of his obligation to pay rent; nor can a person, by rendering only a part of the service which he has contracted to perform, entitle himself to compensation for the service rendered. Rights are assignable; obligations are not assignable. No man can at his own will, or by his own act, rid himself of a legal duty by transferring it to another. This is true even of burdens which, in theory of law, rest upon land, as mortgages, servitudes, and other incumbrances. The partition of the land among several owners will not, in general, relieve any portion thereof of the burden which rests upon the whole and upon every part and parcel thereof, although, as between themselves, the several owners may be entitled to an equalization of the obligation which each is equally liable to perform. (See CONTRIBUTION; EXONERATION; SUBROGATION.) The severity of this rule has been relaxed in a few exceptional cases. Thus, it is held that where a person fails to complete a contract for personal services, in consequence of subsequent disability or death, compensation may be recovered for the services actually rendered. (See RESCISSION; CONTRACT.) Again, in cases where a tenant under a rent is evicted from a part of the premises by paramount title—i.e., by some one having a title superior to that of his landlord—the rent is apportioned, the tenant being liable only for the use and occupation of the part actually retained by him. If, however, the eviction be by the landlord himself or by a stranger, or even if it be by the destruction of the premises, in whole or in part, there will be no apportionment of the rent, the tenant in the former case being freed from all his obligations under the lease, and in the second case continuing liable for the whole rent, notwithstanding the eviction. See EVICTION; LANDLORD AND TENANT; RENT; and the authorities noted under the various titles above referred to.

APPORTIONMENT BILLS. In the United States, laws passed by Congress after each decennial census, to define the number of members of the House of Representatives to which the several States are entitled. Every State has at least one member. Twelve apportionment bills have been passed. The first Constitution adopted by the original thirteen States fixed the number of members at 65, and the ratio of representation at 30,000. Representative population then meant all free white citizens and three-fifths the number of slaves; two-fifths of the slaves, all aliens, and Indians not taxed, were excluded from any share in choosing members of Congress. The Fifteenth Amendment to the United States Constitution conferred the fran-

chise on the emancipated slaves in the South. The following figures show the variations of apportionment made for each census:

Period	States	Members	Pop. to a member
1789	13	65	30,000
1790	15	105	33,000
1800	16	141	33,000
1810	17	181	35,000
1820	24	213	40,000
1830	24	240	47,700
1840	26	223	70,068
1850	32	234	93,423
1860	34	243	127,381
1870	37	293	131,425
1880	38	325	151,913
1890	44	356	173,901
1900	45	386	193,175
1910	46	433	211,887

The House had grown rapidly in number of members until 1830, when it was found that it would soon become unwieldy unless the number of representative population required to a member should be largely increased; so the ratio was increased by one-half (raised from 47,700 to 70,680). Since then the purpose has been to keep the House below 300 members, and the ratio is raised regularly, while the number of members is seldom increased unless by the addition of new States. In the various State legislatures a similar practice prevails. At stated intervals, generally of ten years intermediate with the Federal period, a reapportionment is made. This period is often taken advantage of by the party in the majority, who, by combinations of various kinds, "gerrymander" the State, and so redistrict that their opponents are in a hopeless minority at the polls on many succeeding election days.

APPOSITION (Lat. *appositio*, a setting before, from *ad*, to + *ponere*, to place). A term in grammar signifying the annexing of one substantive to another, in the same case or relation, in order to explain or limit the first; as, *my brother, the physician; Thomas the Rhymer*. Whole sentences or clauses admit of apposition. Thus: "Napoleon sought the way to India through Russia, a stroke of genius." Sometimes a connecting word is used where logical propriety would require apposition; as, *the city of London, for the city London*.

APPOSITION, IN GROWTH. See GROWTH.

APPRAISEMENT (from Eccles. Lat. *apprætiare*, to value at a price, to rate, from Lat. *ad*, to + *pretium*, price). The official or formal valuation of property, in accordance with legal requirements, or by agreement between the parties interested. Official appraisements in legal proceedings are regulated generally by statute, and are most frequently resorted to in the case of merchandise subject to customs duty; of the personal estate of a decedent; of property taken for public use under the right of eminent domain, or damaged by authorized public works, such as canals; of wrecked property; of property of bankrupts or insolvents; and of property levied upon under judicial process, or distrained for rent. Unofficial appraisements are often provided for by the agreement of parties interested, as in the case of insured property which is injured or destroyed. When an appraisement is duly made, in a legal proceeding or by mutual agreement, the value set upon the property is, as a rule, conclusive upon the parties interested therein. The person appointed or agreed upon to make an appraisement is known as an appraiser. He need not be a technical expert,

but must be "reasonably competent." Official appraisers are usually required to make their return or report in writing and under oath.

The United States revenue laws provide for the appointment by the President of appraisers and general appraisers of customs in the several collection districts, and, where these are lacking, for the appointment of merchant appraisers by the collector of the district. See CUSTOMS; TARIFF LAWS.

AP'PREHEND' (Lat. *apprehendere*, to seize). To take a person into custody by warrant of law for the purpose of subjecting him to criminal process. The apprehension of the person accused of crime is not, strictly speaking, a part of the criminal process, but may precede it, or may occur at any stage in its progress prior to execution of the sentence imposed. Indeed, in some jurisdictions, it may be dispensed with altogether, where the sentence does not call for the physical punishment of the offender. In England and the United States, however, the trial of a person accused of crime cannot proceed without apprehension or personal submission of the accused to the process of the court. The term "arrest" (q.v.), which is, in strictness, applicable only to detention in civil cases, is now commonly employed in all cases of taking a person into custody under legal process.

AP'PREHEN'SION (Lat. *apprehensio*, a setting upon, grasping, understanding, from *ad*, to + *prehendere*, to seize). A term denoting the subjective aspect of perception and imagination, as presentation and representation denote their objective side. Two special uses of the word may be noticed. 1. The phrase "direct apprehension" is employed for the habitual recognition of objects and persons whose presence in our surroundings is a matter of course. We do not, in strictness, "recognize" the clothes that we put on every morning, the pen with which we write, the familiar faces of our household; there is no trace of associative supplementing, or of any well-marked mood of familiarity. Rather, we apprehend them directly. Their look and touch set up a certain bodily attitude, the attitude of easy "at-homeness"; and it is the vague, ill-defined mood of "at-homeness" which mediates the recognition (q.v.). 2. Stout has carried this reduction a step further, in his doctrine of "implicit apprehension." "It is possible," he says, "to distinguish and identify a whole without apprehending any of its constituent details." It is possible, e.g., to understand the meaning of a word—something that stands for a highly complex combination—without any mental imagery whatsoever; the meaning is implicitly apprehended by an imageless thought. There is something fascinating about this assumption of "a mode of presentational consciousness which is not composed of visual, auditory, tactual, and other experiences derived from and in some degree resembling in quality the sensations of the special senses," yet which possesses "a representative value or significance for thought"; but its assumption is unnecessary. We know that the "meaning" which accrues to a perception is largely the result of a pre-determination. (See DETERMINING TENDENCY.) Originally the conscious context which gave meaning was elaborate, but eventually this context may disappear and the meaning be carried in physiological terms. So the sound, or articulatory "feel," or sight of the word—or even an unconscious nervous "set"—might come, in time,

to carry the meaning which had originally been carried by associated images. Moreover, there can be no understanding, even of the most familiar word, without the arousal of the mood of "at home," with its constituent organic sensations; and there can be little doubt that these are the real vehicle of the word's meaning. Consult G. F. Stout, *Analytic Psychology* (London, 1909), and E. B. Titchener, *A Text-book of Psychology* (New York, 1910).

APPREN'TICE (LL. *apprenticius*, learner, from *apprehendere*, to grasp). A person, generally a minor, lawfully bound to the service of another, in consideration of maintenance and instruction by that other in some art or trade. It was formerly the law in England that a minor seeking to pursue any trade or art involving skill and experience must serve an apprenticeship of seven years, but this was repealed by Act of Parliament in 1814. Except as hereinafter stated compulsory apprenticeship has never existed in the United States. At present the apprentice system in England and in many of our States applies chiefly to orphans or to the children of paupers, and to some extent in this country to minors who, because of delinquency or improper guardianship, are taken in charge by the State acting *in loco parentis*. In such cases the apprenticeship is usually compulsory, i.e., with or without the consent of the minor affected, but in voluntary apprenticeships, even under the old English system, the consent of the minor was always requisite. The system is now regulated by statutes in most of our States, and their provisions must be strictly complied with, or the apprenticeship will be invalid. Ordinarily the consent of the minor, and of his father, mother, or guardian, is required; the apprenticeship is limited to the age of 21 in the case of boys, and 18 in the case of girls, and ceases upon the death of either the master or the apprentice. By section 4509 of the United States Revised Statutes, a boy who has attained the age of 12 years may be apprenticed to the sea service, with his consent and that of his parents, such apprenticeship to cease when he becomes 18 years of age. The Thirteenth Amendment to the United States Constitution, prohibiting "slavery or involuntary servitude, except as a punishment for crime," it has been judicially declared, does not relieve an apprentice from doing service against his will. Consult Kent, *Commentaries on American Law* (14th ed., Boston, 1896); Austin, *The Law Relating to Apprentices* (London, 1890), for the English laws; and the works referred to under the titles CONTRACT; MASTER AND SERVANT.

Apprentice, Naval. Apprentices are enlisted for the United States naval service between the ages of 15 and 17 to serve until they reach 21 years of age. Minors between the ages of 15 and 17 are not enlisted without the consent of their parents or guardians. The applicant must be of robust frame, intelligent, of perfectly sound and healthy constitution, free from all physical defects or malformation, and not subject to fits. He must also be able to read and write. Upon enlistment boys are rated as third-class apprentices and receive \$9 per month and one ration. After completing their tour of service in a cruising training-ship, if qualified, they are advanced to apprentices of the second class at \$15 per month. After serving one year in cruising ships of war, if qualified, they are advanced to apprentices, first class, at \$21 per

month. Apprentices, first class, during the last year of their enlistment, may be given acting appointments as petty officers, third class, and if they serve the probationary period in the United States navy, they must be recommended to a permanent appointment previous to discharge. Upon the expiration of the enlistment of an apprentice, he will, if recommended, receive an honorable discharge. As soon as practicable after the apprentices are enlisted, they are forwarded to the naval training-station at Newport, where they receive instruction in English studies and in the rudiments of the profession of a seaman, for a period of six months. At the termination of this period the apprentices are transferred to the cruising training ships. There are three departments of instruction and training—seamanship, gunnery, and English, the last embracing the ordinary curriculum of an elementary school. There is also special instruction as buglers, carpenters, sail-makers, and blacksmiths. The course of instruction on board the cruising training ships is of six months' duration. The instruction begun at the shore station is continued aboard the cruising vessels with an increase of practical work. When transferred to the regular service cruisers, the instruction is still continued, and the apprentices are regularly examined before being advanced in rating. Should the term of enlistment of an apprentice expire while he is abroad, he is to be sent to the United States as soon as practicable unless he desires to reënlist.

APPROACH'ES (Fr. *approcher*, It. *appropiarsi*, ML. *appropriare*, come near to, from Lat. *ad*, to + *prope*, near). A term used in the science of fortification, to describe the sunken trenches or passages constructed by an attacking force to cover and protect their advance on a fortified position. Care is taken in the construction of approaches, which are usually in a zigzag course, to avoid enfilade or direct fire, particularly the former. The style of approaches built will depend altogether on the character and strength of the besieged, and the time available for the work. Generally, continuous lines of breastworks are built, parallel to the opponents' lines. If excavation is difficult or impossible, breastworks of sandbags and gabions are built. Approaches are often called *saps*, the operation *sapping*, the diggers *sappers*. The end of the sap nearest the enemy is called the *saphead*. (See *SAP*.) Important examples of this branch of military operations are the works constructed by the French and English troops in the Crimean War of 1854, at the siege of Sebastopol, and more recently the extensive works built by the Japanese in their attack and capture of the strongly fortified and stubbornly defended position of Port Arthur. See *FORTIFICATION*; *SIEGE AND SIEGE WORKS*.

APPRO'PRIA'TION (late Lat. *appropriatio*, a making one's own, from *ad*, to + *proprius*, one's own). 1. The act of applying specific property to a particular use. 2. The act of reserving property for a designated use. In its first signification, the term is applied to unlawful acts, such as those of conversion (q.v.) or embezzlement (q.v.); and to lawful acts, such as the adoption of a design or symbol as a trade-mark, or the final setting aside of specific goods under an executory contract of sale (q.v.) for the purpose of transferring the title or

ownership to the buyer. In this signification, also, it is used in the phrase appropriation of payments. When X owes Y several debts, X has the right to appropriate a payment which he makes to any of the debts. If he pays, without exercising the right, Y may appropriate the payment to any debt. In case a payment is made without appropriation at the time, by either X or Y, and subsequently they disagree as to its appropriation, the courts will apply it in accordance with their conception of the justice of the case. These conceptions, as announced in various reported decisions, are tending toward the establishment of fixed rules. Such rules are applied, however, only to voluntary payments, of which the debtor had the power of appropriation. If, for example, a payment is made under judicial process, as upon the sale of the debtor's property under the foreclosure of a mortgage, it will be appropriated ratably toward the claims for which the mortgage was security.

In the second of the above significations, the term "appropriation" is found most frequently in constitutional and statutory provisions. By Article I, Section 9, of the United States Constitution, it is declared: "No money shall be drawn from the treasury, but in consequence of appropriations made by law." In England, "Not a penny of revenue can be legally expended, except under the authority of some Act of Parliament." The most important statute of this sort is the annual Appropriation Act, by which definite sums are reserved for specified objects. Consult the works mentioned under the titles referred to in this article, and for appropriation by a debtor those referred to under the title *CONTRACT*; for appropriation of funds by the government consult Story, *Commentaries on the Constitution of the United States* (5th ed., Boston, 1891), and Von Holst, *Constitutional Law of the United States of America* (Chicago, 1887).

APPROVE'MENT. The inclosing, by the lord of a manor, of a part of the common (q.v.), or waste lands of the manor, for the purpose of cultivation and improvement. When the acts of approvement and inclosure are completed, the land so inclosed loses its character as common land and is converted to the use of the lord. In general, the lord cannot exercise this right to the exclusion of rights of common, and therefore he can only approve a part of the common land, leaving enough of the waste to satisfy the needs of commoners. The matter is wholly regulated by statute. Consult Pollock and Maitland, *History of English Law* (2d ed., Boston, 1899), and authorities referred to under *COMMON*.

APPROX'IMA'TION (Lat. *approximare*, to approach, from *ad*, to + *proximus*, nearest). In mathematics, a process or a calculated result not rigorously exact, but approaching the truth with continually increasing exactness, or near enough for a given purpose; e.g., the process of solving a higher numerical equation by Horner's method gives a root that, as the process is extended, approaches the true root with continually increasing exactness; multiplying the diameter of a circle by 3.1416 gives the circumference near enough for most purposes. It should be remembered that a result cannot be more accurate than the data, and that in mensuration the data are not usually carried beyond thousandths of a unit; hence the great importance of approximation, even in ordinary arithmetical calculations.

APPUI, à'pwé'. See POINT D'APPUI.

APPUN, äp'pun, KARL FERDINAND (1820-72). A German naturalist, born at Binzlan. In 1849 he undertook a journey of exploration to South America, where he remained for 19 years. The three years from 1868 to 1871 he spent in his native country, after which he returned to his wanderings in South America, where his death was caused by an accident with sulphuric acid. Appun's studies were extended over a large area in Venezuela, Brazil, and British Guiana. His published works include *Unter den Tropen, Wanderungen durch Venezuela, am Orinoco, durch Britisch-Guayana, und am Amazonenstrom in den Jahren 1849-68* (1871).

APPUR'TENANCE (OF. *apurtenance, apartenance*, from Lat. *ad*, to + *pertinere*, to belong). In law, a subordinate right to another's land which is an incident to the estate of the persons entitled to enjoy the right. Upon conveyance of the principal estate, the appurtenances pass to the grantee without being expressly mentioned in the grant. An appurtenant right is the antithesis of a right in gross, which is a property right attached to the person of the owner. It is not an incident of real estate and may be conveyed apart from it. Appurtenances are classified as profits, sometimes called rights of common, and easements. A profit appurtenant is the right of the owner of real estate, as such, to take a portion of the soil or product from the land or water of another, as to pasture cattle, cut timber, catch fish, take ore or gravel or the like. An easement appurtenant is any right of the owner of real estate, as such, in or over the land of another, which does not involve taking any part or product of the land, as a right of way, or the right to have light and air pass over the land of another. See EASEMENT; PROFIT; SERVITUDE; and the authorities referred to under REAL PROPERTY.

APRAXIN, ä-präks'in, FEDOR MATVEYEVITCH (1671-1728). A distinguished Russian admiral. When hardly 10 years of age he entered the service of Czar Fedor Alexeyevitch, and at 12 that of Peter the Great, who conceived a great attachment for him, which lasted during the life of the monarch. In 1692, when but 21, he was appointed governor of Archangel, a post of considerable importance in those days. Rising gradually in rank and favor, he was after the year 1700 the most powerful and influential person at the court of the Czar, who made him chief admiral of the Russian navy, of which, in fact, Apraxin may be considered the creator. While Peter was fighting the Swedes in the north, Apraxin was building war vessels, fortresses, and wharves in the south. In 1709 he was appointed president of the admiralty; in 1708 he defeated the Swedish general Lybeker in Ingermanland and saved the newly built city of St. Petersburg from destruction (in appreciation of which services he received a medal from Czar Peter); in 1709, on Peter's return from abroad, Apraxin was made one of his secret advisers and given the title of Count; in 1710 he captured the important town of Viborg, in Finland, and in 1711 commanded in the Black Sea during the Turkish War. The following year he returned to the north, and in 1713, with a fleet of 200 vessels, sailed along the coast of Finland, took Helsingfors and Borgå, and defeated the Swedish fleet. The result of his great successes was that at the peace of Nystad,

in 1721, Russia obtained possession of the coveted Baltic Provinces and became the leading power in the Baltic Sea. In 1715 and again in 1718 Apraxin was found guilty of embezzlement and extortion, but, owing to the high favor in which the Czar held him, he escaped serious punishment and lost nothing in reputation. Even for the fine which Apraxin had to pay he was more than recompensed by his royal friend, who presented to him many private estates. Remaining Peter's closest adviser and best aid, Apraxin accompanied him in his Persian War in 1722 and was present at the siege of Derbend. His last naval expedition was in 1726, when he repaired with the Russian fleet to Reval, to defend that place against an expected attack by the English. He died at Moscow.

APRAXIN, STEPAN FEDOROVITCH, COUNT (1702-60). A Russian general. In 1737 he served against the Turks, gaining rapid promotion, being appointed ambassador to Persia in 1742, general-in-chief in 1746, and field-marshal in 1756. In Elizabeth's court he was a strong opponent of Prussian influence and in the Seven Years' War, as field-marshal, led an army of invasion into Prussia, defeating the Prussian Field Marshal Lewald at Grossjägerndorf, 1757. In the midst of success, he retreated, at the call of Bestuzheff, who wanted to raise Paul to the Russian throne over his father (Peter III), who was the legitimate heir, as the Empress Elizabeth fell dangerously ill. On recovering, the latter removed Bestuzheff and put Apraxin into prison. Of the manner of his death there exists the following legend in Russia: The court-martial reported to the Empress that the prisoner denied any guilt, whereupon she recommended it to apply the last remedy—to set him free. At the next session, when Apraxin persisted in claiming innocence, the president of the court-martial urged his colleagues to apply "the last remedy." No sooner were these words uttered than Apraxin, thinking they referred to torture, fell in a fit of apoplexy.

A'PRICOT (Fr. *abricot*, Sp. *albaricoque*, Portug. *albricoque*, from Ar. *al-birqūq*, *al-burqūq*). A fruit (Lat. *Prunus armeniaca*, i.e., Armenian plum) resembling in several respects both the peach and plum and really intermediate between them. It is supposed to be a native of China and was brought into Europe at the time of Alexander the Great. The flesh of the apricot is firm, sweet, and aromatic; the stone is smooth and slightly furrowed, like that of some plums. The skin is downy, like that of the peach. The tree resembles the plum more than the peach, in that it has ovate, acuminate, and cordate, smooth, double-toothed leaves, on long stalks, and solitary, sessile, white flowers which appear before the leaves.

The apricot is grown abundantly in France, Italy, Turkey, Syria, and Palestine, and to some extent in Australia and South Africa. The tree is as hardy as the peach, but the danger of loss from frost, owing to its early blooming habit, as well as from plum curculio, has restricted its cultivation in the eastern United States. In California and Oregon it is extensively raised. In England it is a favorite with gardeners and is grown both in the open and as espalier or cordon on protected walls. In the eastern United States, when trained in similar manner to a northern or northeastern wall, the buds are usually sufficiently retarded to escape frost.

In the eastern United States the apricot is usually budded or grafted upon the plum. This fits it for heavy soils; on light soils it does well when worked upon the peach, and in California, where apricot stocks can be obtained, it is worked upon the apricot itself. In New York State there are commercial orchards of apricots, top-worked on the plum. The Russian apricot is a hardy form of *Prunus armeniaca*, and although not in itself of merit for its fruit, may prove to be a valuable stock for the more desirable forms. The Japanese apricot, which is chiefly grown for its blossoms, is *Prunus mume*. Orchard culture is, in general, the same as for the peach. (See PEACH.) The apricot has numerous varieties, of which some of the best are Holland (Breda), Moorpark, Early Golden, and Peach. The fresh fruit is now commonly found in the markets. Large quantities are also dried in California and Oregon in evaporators. The product is extensively shipped to different parts of the United States and abroad, for cooking purposes. Apricot pits are now exported to Europe where an oil similar to almond oil is extracted from the kernels. In the Orient the kernels are largely eaten like almonds. Dried sheets of apricot paste form an important part of the rations of the Mohammedan soldier. For composition and food value of the fruit, see general article on FRUIT. For illustration see Plate of ABUTILON and DRUPES.

Diseases. The apricot is subject to the same diseases as are the peach and plum. The most common disease is the *leaf rust*. It may be prevented by the thorough use of the standard fungicides (q.v.).

APRIES, ā'pri-ēz (Gk. Ἀπρίης, *Apriēs*; Uaphres, Egyptian, *Uah-eb-ré'*). An Egyptian King of the twenty-sixth dynasty. In the Old Testament he is called Pharaoh-hophra. He reigned from 589 to 570 B.C., at the time when the Babylonians subjected Palestine and threatened Egypt. He aided the Jews in their resistance against Nebuchadnezzar, but was unable to prevent the fall of Jerusalem. Apries seems, however, to have warded off the Babylonian attack upon Egypt. The revolt of his native troops sent against the Cyrenæans in aid of the Libyan King Adikran led to the usurpation of Amasis (q.v.). Herodotus, who in general gives a strangely distorted account of Apries, relates that the usurper kept him alive for some time, until at last he was forced to yield up the dethroned King to an infuriated mob. This story is, however, not confirmed by the Egyptian inscriptions.

A'PRIL. See MONTH.

APRIL FOOL. The first of April, known as "All Fools' Day," has long been in America, and for a still longer period in many European countries, a day for mocking unwary persons by sending them on bootless errands or making them the victims of some other practical joke. The custom seems to have been unknown to German antiquity. Grimm regards it as having been introduced into Germany from France, in comparatively modern times. Various theories have been held as to the origin of the custom. One writer traces the custom to the miracle-play formerly represented at Easter, which sometimes showed the sending of Christ from Annas to Caiaphas and from Pilate to Herod; another finds the origin in some ancient pagan festival, such as the Huli festival held by the Hindus on March 31, or the Feast of Fools, celebrated

by the Romans on February 17, at which similar tricks were played. In France the victim is called *un poisson d'Avril*, 'An April fish' (possibly from the reopening of the fisheries at that season); in Scotland, a gowk or a cuckoo.

APRIL HOPES. One of the most striking and characteristic of Howells's books, published in 1887. The heroine, Alice Pasmer, is a well-born, well-bred New England girl, but with a Puritan conscience which "makes no allowance for human nature."

A PRIO'RI (Lat. from something prior, foregoing, *a*, from, and *prior*, prior). In Aristotelian terminology, a designation applied to arguments from cause to effect, as opposed to *a posteriori* (Lat. from something posterior, following), which describes arguments from effect to cause. But since Kant's day *a priori* has become an epithet, often polemic, applied to judgments alleged to have a validity independent of experience. Its antonym in this meaning is still *a posteriori*, which means 'resting upon experiential proof.' The attitude one takes toward the question of the possibility of *a priori* judgments is one of the most crucial tests of one's affiliation among the philosophic schools. Rationalists, Intuitionists, and Criticists (i.e., followers of Kant) maintain that many of our judgments are *a priori*; Empiricists deny it. The debate, however, seems to be conducted upon a false assumption, shared by most of the protagonists on either side, viz., that experience comes piecemeal, or, that technically, it is atomistic in character. If such were the case, then any valid universal judgment would have to be *a priori*, for no number of *isolated* experiences could point to a general law. But experience does not grow by the accretion of unrelated elements; rather is its growth a process of organic expansion under stimulation, which for practical purposes must be regarded as proceeding from the external world. In the knowledge thus acquired, there is the coöperation of what may be distinguished as two factors, the nature of the organism and the nature of the stimulus that gives rise to a content in consciousness. Now, these two factors may conveniently be designated the *a priori* and the *a posteriori* constituents of knowledge. But it is of the utmost moment to guard against the error of supposing that antecedently to experience there is a thing called mind which comes to the act of experience ready equipped with either a determinate nature or with full-blown knowledge of some sort. The literature of the subject is enormous. Omitting all reference to ancient philosophers, some of the noteworthy books bearing on the topic are: J. Locke, *Essay Concerning Human Understanding* (best ed., by Fraser, 2 vols., Oxford, 1894); Leibnitz, *Nouveaux essais sur l'entendement humain*, English by Langley (New York, 1896); also selections translated by Duncan (New Haven, 1890) and by Latta (Oxford, 1898); D. Hume, *Treatise of Human Nature*, book i, part iii (Selby-Bigge ed., Oxford, 1888); D. Hume, *An Enquiry Concerning Human Understanding* (Selby-Bigge ed., Oxford, 1894); Kant, *Kritik der reinen Vernunft*, English by Max Müller (London, 1896); Hegel, *Encyclopädie der philosophischen Wissenschaften im Grundrisse* (Heidelberg, 1830), in part translated into English by Wallace under the titles, *Hegel's Logic* (Oxford, 1892-94) and *Hegel's Philosophy of Mind* (Oxford, 1894); R. H. Lotze,

Logik (Leipzig, 1880), edited in English by B. Bosanquet (2 vols., Oxford, 1888); J. S. Mill, *Logic and Examination of Sir W. Hamilton's Philosophy* (London, 1867; last in author's lifetime, 1872); E. Caird, *A Critical Account of the Philosophy of Kant* (2 vols., New York and London, 1889); F. H. Bradley, *Principles of Logic* (London, 1883); B. Bosanquet, *Logic* (Oxford, 1888); L. T. Hobhouse, *Theory of Knowledge* (London, 1896). See also KANT; DEDUCTION; INDUCTION; LOGIC; EMPIRICISM; TRANSCENDENTALISM.

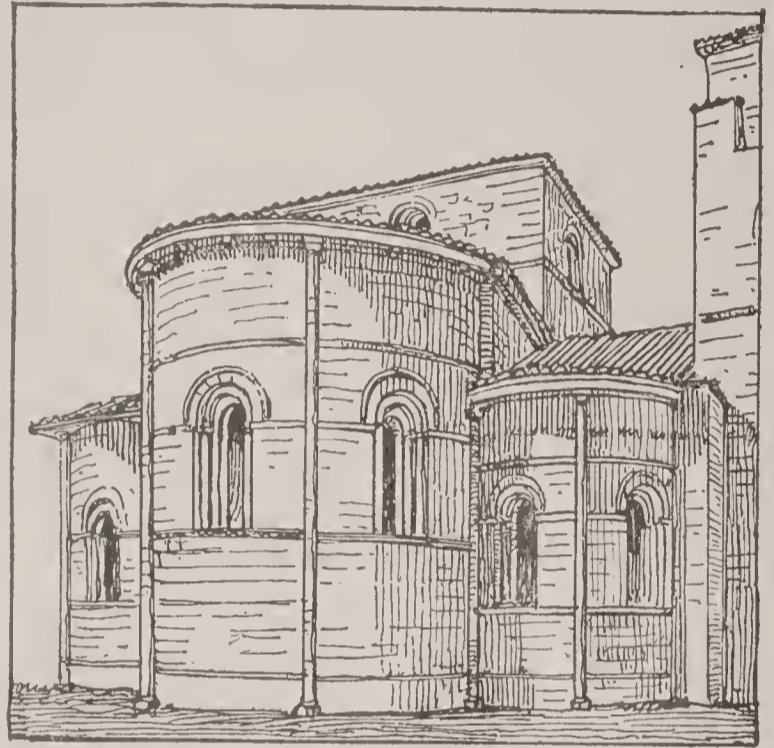
A'PRON (by wrong division into *an apron* for a *napron*, OE. *napron*, OF. *naperon*, Fr. *naperon*, dimin. of *nappe*, cloth, tablecloth, from Lat. *mappa*, cloth, cf. *napkin*). An outer garment, originally of linen but often of cloth or leather, covering the front of the person and intended to protect other clothes from injury. It is used in Coverdale's translation of the Bible (1535) and also in the Authorized Version, to render the Hebrew word *chagorah*, applied to the covering of fig-leaves made by Adam and Eve after the Fall. It has been applied also to various mechanical devices used as a means of protection as (1) in military affairs, a rectangular piece of lead, with a projection on the under side, used to cover the vents in old-fashioned cannon; (2) in shipbuilding, the piece of curved timber set just above the forward end of the keel, to join the several pieces of the stem and connect them more firmly with the keel (see SHIPBUILDING); (3) in engineering structures, a platform placed at the base to protect it from heavy shocks; (4) in carpentry, the horizontal piece of timber which takes a carriage-piece or rough string on a staircase, and also the ends of joists which form the half-space or landings; (5) in plumbing, the lead sheeting or flushing dressed on the slates in front of a dormer window or skylight; (6) in mechanics, the piece which holds the cutting tool in a planing machine; (7) in architecture, a more or less flat member placed against or above anything for protection, as the decorative member under a veranda cornice. Besides the obvious uses of aprons in the original sense, they are worn also in elaborately decorated forms as part of the costume of Freemasons (see MASONS, FREE) in the lodge; while bishops and deans in the Church of England wear an apron of black or purple silk which is an abbreviation of the older cassock.

AP'ROSEX'IA. Lack of power to concentrate the attention. The term is most frequently used to describe a condition of mental vacuity, inattention, and restlessness present in many children who suffer from adenoids (q.v.).

APSE (for derivation, see APSIDES). An architectural term used by Greeks and Romans to designate a vaulted structure, such as a domical chamber, or even a triumphal arch. The Romans applied it particularly to the large, semicircular niche that projected from some of their temple cellas or basilicas; in the temples it was the place for the cult image of the god; in the basilica it was the prætor's tribunal, where he sat surrounded by his assessors. In both cases it was the culminating point of the structure. The partial derivation of the Christian church or basilica from the Roman basilica or law court makes it natural that this semicircular projection or apse should appear as an integral part of the earliest churches. Early Church writers called it *exedra*, *concha*, or *conchula bematis*. The higher clergy were seated on a

bench around the apse; the bishop took the prætor's place in the centre of the semicircle. Being the most sacred part of the church, the apse received the richest and most artistic decoration, and the most sacred subjects were depicted upon its semidome and walls. The width of the apse usually corresponded to that of the nave or central aisle of the church, whose end it seemed to form. It was not until the seventh or eighth century that smaller apses were often placed in the same way at the ends of the side aisles. They may have developed from the small sacristies which had for centuries usually been placed there.

Byzantine architects gave a polygonal form to the exterior, while preserving the interior semicircular outline (e.g., Ravenna). Square apses,



APSE FLANKED BY TWO APSIDIOLES.

S. Pedro Avila (Spain)

very rare at first, became common in the eleventh, twelfth, and thirteenth centuries, especially in Cistercian abbeys. The development of transepts led sometimes to the use of apses at their terminations, as in the Romanesque churches at Cologne and in the French Gothic churches of Senlis, Noyon, and Soissons. Many German Romanesque (and a few Gothic) churches have an apse at the west as well as the east end. The addition of an ambulatory (q.v.) with radiating chapels greatly enriched the east end of the church, both internally and externally; while the lengthening of the eastern portion between the apse and the transepts to accommodate the choir, transferred thither from its former position in the crossing and eastern part of the nave, further increased the importance and splendor of the apse, the whole eastern part of the church, including the apse, ambulatory, and chapels, being thereafter generally known as the "choir." This change seems to have begun in the twelfth century. The development of Gothic construction, with its multiplied buttresses, pinnacles, and flying arches, gave still greater magnificence to the exterior of the apse, in contrast to its primitive plainness (Amiens, Le Mans, Cologne cathedrals). See CHOIR, CHURCH.

APHERON, äp'she-rôn'. A peninsula of Russia on the west shore of the Caspian Sea (Map: Russia, G 6). It is famous for its immense deposits of naphtha, probably the richest

in the world. The soil is sterile, and strong winds prevail. See BAKU.

AP'SIDES, äp'si-dēz (Gk. pl. of *ἀψίς*, *apsis*, loop, juncture). The two extreme points in the orbit of a planet—one at the greatest, the other at the least distance from the sun. The term "apsides" is applied in the same manner to the two points in the orbit of a satellite—one nearest to, the other farthest from, its primary; corresponding, in the case of the moon, to the perigee and apogee. A straight line connecting these extreme points is called the line of apsides, or the major axis of the orbit. In the planetary orbits this line has no fixed position in space, but undergoes a motion in the plane of the orbit. This fact in the orbit of the earth gives rise to the difference between the anomalistic (q.v.) and sidereal years. This motion of the line of apsides is especially remarkable in the orbit of the moon, an entire revolution taking place in 3232.57 days, or a little less than nine years.

APSID'IOLE. A small apse or apse-like projection; used especially of the small semicircular chapels radiating from the apse or ambulatory, or projecting from the east side of a transept, in early mediæval churches. See APSE; CHURCH.

AP'SLEY HOUSE. The mansion built by Lord Bathurst in 1785, and purchased in 1820 by the government for the Duke of Wellington in reward for the latter's services to the nation in the Napoleonic wars. In 1830 its windows were broken by the mob on the anniversary of Waterloo, and the Duke was forced to have them protected by iron shutters.

APSLEY STRAIT. See BATHURST ISLAND.

APT, äpt (anciently, Lat. *Apta*). The capital of the arrondissement of the same name, in the department of Vaucluse, France, on the Coulon River and the Mediterranean Railway (Map: France, S., K 5). It contains a communal college, library, meteorological station, and manufactures silk. There is some trade in grain and fruit. Its cathedral is supposed to have been built about the eighth century, and it contains numerous specimens of Romanesque architecture. Roman remains have been found in the vicinity, for in ancient times Apt was the chief city of the Vulgientes and received much attention from Julius Cæsar, who gave it the name of Apta Julia. It came into the possession of France in 1481. Pop., 1901, 5948; 1906, 6418; 1911, 6336.

AP'TERAL (having no wings, Gk. *ἀ*, *a*, priv. + *πτερόν*, *pteron*, wing). A term applied to Greek and Roman temples without lateral colonnades, or *pteromata*, outside the *eella*; and also to Christian churches which either had no aisles or whose façades had the form of a single unbroken gable, not divided into three sections.

AP'TERYG'OTA. A prime division of Insecta, embracing primitive insects without wings and including the Thysanura and Collembola. See BRISTLETAIL; SPRINGTAIL.

AP'TERYX (Gk. *ἀ*, *a*, priv. + *πτέρυξ*, *pteryx*, wing). The scientific name for a genus of small ratite birds of New Zealand, comprising the order Apterygiformes. It has come into general use and, except locally, has taken the place of the native name "kiwi." The term "wingless" is incorrect, for while the fore limbs are greatly reduced and functionless, yet there are present the humerus and a single complete digit.

This remarkable group of birds was for a long time a puzzle to ornithologists. Sham first

described an apteryx in 1813, and not until the accumulation of material in 1833 was it possible to assign it even its approximate place in systematic classification. Owen investigated its anatomy so carefully that, supplemented by Parker's later studies, the structure of few birds is even to-day more thoroughly understood. Its body shows a confusing mingling of primitive and specialized characters. For example, while the plumage covers almost the entire body uniformly, yet the wings, nostrils, and oil-gland are extremely specialized. Until the middle of the last century almost no living birds had been seen by travelers or naturalists, and not until 1847 did a second species become known. Three years later a third was discovered. In 1851 the first living apteryx reached England, and since then many have thrived in various zoölogical gardens and have laid eggs, none of which, however, have been fertile. They are ill adapted for exhibition, as their nocturnal habits keep them hidden from view, usually concealed beneath straw or any material at hand. In 1872 a complete account of the apteryx was published by Sir W. Buller. This extent of knowledge is very fortunate, for these birds, so highly interesting as relics of past times and an extinct fauna (see MOA), are to-day approaching extinction. Portions of their haunts have recently been set aside as game preserves, so there is a bare chance that they may exist for some time and possibly hold their own for years. Six forms are recognized: the apteryx, or kiwi, of North Island, *Apteryx bulleri* or *mantelli*; *Apteryx oweni*, a very different species, known as the Gray Apteryx, is confined to South Island, while a spotted sub-species of this form, *Apteryx oweni occidentalis*, is found on both islands. *Apteryx australis*, *lawryi*, and *haasti* complete the list. Consult Pott's articles in the *Transactions of the New Zealand Institute*.

The apteryx, or kiwis, are about the size of common fowls and are robust in form, with massive legs and feet, having a short hind toe (not present in other existing Ratitæ, no visible wings or tail, a very long, down-curved flexible bill, with the nostrils at the extreme end, and a covering of loosely vaned, almost hairlike feathers, which have no after shaft. The southern and northern kiwis are dark reddish-brown, striped lengthwise with yellowish-brown, but Owen's kiwi, which is much smaller than the others, is light grayish-brown transversely barred with black. Fossilized species are also known from remains found in company with the bones of moas. The females are about one-sixth larger than the males—a fact connected with their extraordinary reproduction, for the female lays only one yellowish-white egg (or uncommonly two) annually, which is gigantic in proportion to the size of the bird, that of the North Island species measuring 5 by 3 inches, or nearly a quarter of the bulk of the mother's body. This is deposited in a depression in the ground, and is incubated wholly by the male; and the young one when hatched is well grown, well feathered, and able to take care of itself.

These birds are natives of the mountainous forested parts of New Zealand; they are entirely nocturnal in their habits, and doze inertly in the daytime, in a rolled-up attitude. In former days, when they were numerous, they went about in small companies, and toward morning the woods rang with their shrill cries. The loss of flight-power is compensated by great strength

of the feet (the sharp claws of the toes are good weapons), and they run swiftly. Their food consists mainly of earthworms, which are obtained by plunging the bill deeply into the ground, the location of the worm having been detected, probably, by the sense of smell aided by that of touch. The nostrils differ from those of all other birds in being at the extremity of the upper mandible, and the bird makes a continual sniffing sound as it moves about. Other insects and some fruits are also eaten. The common statement that when quiet the kiwi sustains its weight by resting upon the point of the bill is an exaggeration; this attitude is rarely taken. Their numbers are greatly decreased, and these birds will soon become extinct, no doubt, as a wild species. Kiwis are still numerous, however, in some of the more secluded forests; but the Norway rat is fatal to all ground birds. Kiwi feathers were prized by the Maoris for hair-like ceremonial mats.

Consult Newton, *Dictionary of Birds* (London and New York, 1893-96), for a general history of investigations. For anatomy, consult: Owen, *Transactions of the Zoölogical Society*, vol. ii (London, 1846); Parker, *Transactions of the Philosophical Society* (London, 1891, 1892). For habits, consult Buller, *Birds of New Zealand* (2d ed., London, 1888), various articles in the *Transactions of the New Zealand Institute*, and Hutton and Drummond, *Animals of New Zealand* (1905). See Plate of CASSOWARIES, ETC.

AP'THÆ. See APITHÆ.

AP'THORP, WILLIAM FOSTER (1848-1913). An American writer and musical critic, born in Boston, Mass. He graduated at Harvard in 1869 and studied music under J. K. Paine and B. J. Lang. He is well known as the author of *Hector Berlioz: Selections from his Letters and Writings*, with a biographical sketch, a pioneer work in English on this composer; and books of musical criticism, including *Musicians and Music Lovers* and *The Opera, Past and Present*. He lectured at the Lowell Institute, Boston, and the Peabody Institute, Baltimore, and taught at the New England Conservatory, Boston, and the College of Music of Boston University. From 1892 to 1901 he wrote the analyses of musical compositions which appeared in the programme of the Boston Symphony Orchestra. For twenty years after 1881 he was musical critic of the *Boston Transcript*.

APULEIUS, LUCIUS. A Latin satirical writer of the second century. He was born about 125 A.D., at Madaura, in Africa, where his father was a magistrate, and a man of large fortune. Apuleius first studied at Madaura, then at Carthage, which at one time enjoyed a high reputation for its school of literature. Afterward he went to Athens, where he entered keenly upon the study of philosophy, displaying a special predilection for the Platonic school. The fortune bequeathed to him at his father's death enabled Apuleius to travel extensively. He visited Asia and Italy and was initiated into numerous religious mysteries. The knowledge which he thus acquired of the priestly fraternities he made abundant use of afterward in his *Metamorphoses*, or *Golden Ass*. He went also to Rome, perhaps about 150, and practiced law there; at this time, too, he published, it would seem, his *Metamorphoses*. His first appearance in literature arose from a lawsuit. He had, about 155, returned to Africa, and had gone to Dea, a town on the coast near

the modern Tripoli. Having married there a middle-aged lady, named Pudentilla, very wealthy, but not particularly handsome, he drew down upon his head the malice of her relatives, who desired to inherit her riches, and who accused Apuleius of having employed magic to gain her affections. His defense (*Apologia*, still extant) spoken before Claudius Maximus, proconsul of Africa, was an eloquent and successful vindication of his conduct. After this event his life appears to have been devoted zealously to literature and public oratory, in both of which he attained great eminence. He was extremely popular, so that Carthage and other cities erected statues in his honor.

The *Metamorphoses*, or *Golden Ass*, the work by which his reputation has survived, is a romance or novel, whose principal personage is one Lucian, supposed by some, chiefly on the evidence of the eleventh and last book, to be the author himself. Lucian, in search of adventure and keen for knowledge of various mysteries, is by an accident transformed by magic into an ass; in this guise he has all sorts of adventures till at last he recovers his human form by eating roses in the hands of a priest of Isis. It has been often regarded as a satire on the vices of the age, especially those of the priesthood, and of quacks or jugglers affecting supernatural powers, though Bishop Warburton and other critics fancied they could detect in it an indirect apology for paganism. More probably it is only a series of amusing stories without serious purpose. Its merits are both great and conspicuous, as are also its faults. Wit, humor, satire, fancy, learning, and even poetic eloquence abound. Apuleius had a wonderful power of accurate and vivid observation of details, and his stories are highly realistic. The style is vigorous and exuberant, but is also disfigured by excessive archaisms, and there is a frequent affectation in the metaphors, etc. The name *Golden Ass* is not due to Apuleius himself, but is a complimentary designation of later times. The most exquisite thing in the whole work is the episode of Cupid and Psyche (imitated by La Fontaine). It has been by some supposed to be an allegory of the progress of the soul to perfection. Besides the *Apologia* and *Golden Ass*, we have from the pen of Apuleius an anthology in four books, called *Florida*, a work on the daemon of Socrates, one on the doctrines of Plato, one on *The Universe*, etc. Many of his works are lost. A recent edition is by J. van der Vliet, the *Metamorphoses* (Leipzig, 1897); *Apologia* and *Florida* (Leipzig, 1900). Much better is that by R. Helm, the *Apologia* (Leipzig, 1895); the *Metamorphoses* (Leipzig, 1907); *Florida* (Leipzig, 1910); and the *De Philosophia Libri*, by P. Thomas (Leipzig, 1908). The *Golden Ass* was translated into English by T. Taylor (London, 1822), by Sir G. Head (London, 1851), by Walter Pater (q.v.), in his *Marius the Epicurean*, and by H. E. Butler (Oxford, 1910). Butler also translated the *Apologia* and the *Florida* (Oxford, 1909). A still earlier translation by Adlington in 1566 has been republished, with an introduction by Whibler (London, 1893), and again with an introduction by T. Seecombe (New York, 1913). An English version of the works of Apuleius was published in London, 1853. Consult also for Apuleius's life and works E. Rohde, *Rheinisches Museum*, pp. 66-113 (1885); and the edition of the Cupid and Psyche story by L. C. Purser (London, 1910).

APU'LIA. A part of ancient Italy lying along the Adriatic Sea, and bounded on the west and south by the Frentani, Samnium, Lucania, and Calabria (Map: Italy, L 6). Modern Apulia (It. *Le Puglie*) comprises the provinces of Bari, Foggia, and Lecce. It is a vast plain drained by numerous small streams flowing toward the Adriatic; on the whole, however, the land is *pauper aquæ*, as Horace called it. The country has extensive areas of pasture land, and the raising of domestic animals is the chief occupation of the inhabitants, as it was in ancient times. Chief towns: Bari, Brindisi, Foggia, and Lecce. Pop., 1881, 1,519,064; 1901, 1,949,423; 1911, 2,128,632. According to old poetic traditions, Daunus, King of the Apulians, when banished from Illyria, had settled in Apulia. The chief towns of Apulia were Arpi, Barium, Canusium, Luceria, and Venusia (birthplace of Horace). The Romans first came in contact with the Apulians in 326 B.C., when a friendly alliance was formed; but the Apulians joined the Samnites, the Tarentines, and finally Hannibal in attempts against Roman supremacy. Much of the Second Punic War was fought in Apulia, and here the Romans lost the disastrous battle of Cannæ (q.v.). After the fall of Hannibal Apulia was wholly subjugated by Rome. When Augustus divided Italy into districts, the *Regio II* was made to include Apulia and Calabria.

APURE, á-pōō'râ. An important tributary of the Orinoco, rising in the eastern slopes of the Andes near Bucaramanga, in Colombia, South America. Flowing eastward it enters Venezuela, receiving from the south the Cauca-gua River and from the north the Portuguesa, the Guarico, and others; finally joining the Orinoco 200 miles above Ciudad Bolivar. It is more than 700 miles long, navigable through the greater part of its course.

APURIMAC, ä'pōō-rē'mäk (Peruvian *upu*, principal, chief + *rimac*, oracle). A Peruvian river, one of the head streams of the Ucayali (q.v.) (Map: Peru, C 6). It flows from Lake Vilafro in the high Andes in lat. 15° S., about 100 miles northwest of Lake Titicaca, and flows northwest throughout about 500 miles of its course, but after uniting with the Perene it is known as the Tambo. It flows eastward and then northward for a distance of 100 miles to its place of union with the Quillabambi, to form the Ucayali, which in turn, uniting with the Marañon, forms the Amazon. The Apurimac possesses the peculiarity that its tributaries, the chief of which are the Pampas, Mantaro, and Perene, are received from the west side. Among the tributaries of the Amazon it probably rises nearest to the Pacific Ocean. The Apurimac and its tributaries are of the nature of great mountain torrents, and their rocky and rugged banks are generally difficult of access and oft-times wholly inaccessible. The valleys through which they flow vary in climate and productiveness with change of altitude. The lower valleys yield the products of the tropics, and the upper ones those of temperate and cold climates. The basin of the Apurimac, as a whole, is said to be the finest part of Peru, and to contain the largest proportion of native population—the best specimens of the aboriginal civilization.

APURIMAC. A department of Peru (Map: Peru, C 6). Area, 8189 square miles. The surface is largely elevated and well watered. Coffee, rubber, sugar, and cacao are grown, and gold and silver are mined. Cattle raising is a minor in-

dustry. The population was officially estimated in 1896 at 177,387. Capital, Abancay.

A'PUS (Gk. ἄπους, without feet). A genus of entomostracous crustaceans, within the family Apodidæ and the sub-order Phyllo-poda. The more common species are 2 or 3 inches in length, and in the general shape of the large, shield-like carapace recall horseshoe crabs. In spite of the generic name, from 11 to 60 pairs of feet or appendages are present. Their eggs when dried in the mud may remain dormant for months or even years and in this state be transported long distances attached to the feet of water birds. They usually swim back downward and thus protect their soft body from the attacks of water beetles and other aquatic enemies. For many generations parthenogenetic reproduction by unfertilized eggs may take place, and in the case of some species the males have never been discovered.

AQUÆ GRATINÆ. See AIX-LES-BAINS.

A'QUÆ SEX'TIÆ (Lat. Sextian waters). A town of ancient Gaul, famous for the victory of Marius over the Teutones, Ambrones, and other German tribes, in 102 B.C. It is now known as the French town of Aix, in Provence.

AQUÆ SO'LIS (Lat. waters of the sun). Now the English town of Bath (q.v.); an ancient Roman city, remarkable for its magnificent edifices and for the medicinal property of its springs. Recent excavations have brought to light the remains of many Roman bath-houses.

AQUÆ STATIELLÆ. See ACQUI.

AQUAMARINE, -mā-rēn' (Lat. *aqua*, water + *marinus*, belonging to the sea). A bluish-green variety of beryl that is used as a gem. It is found in a number of localities in the United States, the richest-colored gems coming from Royalston, Mass. A celandine green variety of apatite is also called aquamarine.

AQUA RE'GIA (Lat. royal water). A name given to a mixture of nitric and hydrochloric acids, which may be used as a solvent for gold, whence its name, as gold was called by the alchemists the king of metals. It is usually prepared by mixing one part of nitric acid with from three to four parts of hydrochloric.

AQUARELLE. See WATER-COLOR PAINTING.


AQUA'RIANS. A name applied to several different sects in the early Church. It was used (1) of some of the Ebionites, who were charged with idolatrous veneration of water as the source of life; (2) of Manichæan ascetics who rejected the use of wine as a luxury. (3) The name was chiefly used of the followers of Tatian (q.v.), who advocated the use of water instead of wine in the eucharist. They lasted to the time of Augustine, in the fourth century.

AQUA'RIMUM (Lat. a watering-place for cattle, from *aqua*, water). A tank or vessel containing either salt or fresh water, in which either marine or fresh-water plants and animals are kept in a living state. From 1854 to 1860 there was a mania for these scientific toys, and they became not only an aid to study, but a source of rational amusement, depending in principle upon the relations discovered by science between animal and vegetable life, and particularly upon the consumption by plants under the action of light of the carbonic-acid gas given forth by animals, and the consequent restoration to the air or water in which they live of the oxygen necessary for the maintenance of animal life. The aquarium must, therefore, contain both plants and animals, and in something like a

proper proportion. Zoöphytes, annelids, mollusks, crustaceans, and fishes may thus be kept in health and their habits observed. If perfectly balanced, the aquarium requires little care beyond the replacing of water lost in evaporation, but where there is a preponderance of animal life the water must be frequently aërated, which can be accomplished by taking up portions of it and pouring them in again from a small height. The fresh-water aquarium is frequently provided with a fountain, which produces a continual change of water; but even where this is the case, the presence both of plants and animals is advantageous to the health of both. When sea water cannot be easily procured for the marine aquarium, a substitute may be made by mixing with rather less than 4 quarts of spring water $3\frac{1}{2}$ ounces of common table salt, $\frac{1}{4}$ ounce of epsom salts, 200 grains troy of chloride of magnesium, and 40 grains troy of chloride of potassium. With care the water may be kept pure for a long time. No dead animal or decaying plant must be permitted to remain in it. Salt water, artificially prepared, is not fit for the reception of animals at once; but a few plants must first be placed in it, for which purpose some of the green algæ, especially species of *Ulva*, are most suitable. The presence of a number of mollusks, such as shore snails, is necessary for the consumption of the continually growing vegetable matter, and of the multitudinous spores, particularly of algæ, which would otherwise soon fill the water, rendering it greenish or brownish, and non-transparent, and which may be seen beginning to vegetate everywhere on the pebbles or on the glass of the tank. In a fresh-water aquarium, pond-snails, such as species of *Lymnæa* or *Planorbis*, are equally indispensable. For large aquaria, tanks of plate glass are commonly used; smaller ones are made of bottle-glass or crystal.

Aquaria should be placed where they have sufficient access to good light. This is, of course, essential to the green plants and will also prevent the excessive growth of dangerous fungi. The gills of fishes, their eyes, and any wound on the body are frequently attacked by these fungi. These can often be removed in the case of fresh-water forms by a temporary bath in a common salt solution, sufficiently strong and for a sufficient length of time to kill the fungi. The fish, although severely affected by the salt, will revive upon being flushed with an abundance of fresh water. The plants or animals with which the aquarium is to be stocked must vary with the tastes and purposes of the individual. Among fishes, the goldfish (q.v.) stands first in beauty, variety of fantastic forms, and in tenacity of life. The sticklebacks (q.v.) are desirable because of their small size and their interesting nest-building and breeding habits. Crabs and anemones are common objects in marine aquaria. Notable large public aquaria are maintained in various cities of Europe. From a scientific standpoint, the aquaria at the Naples Marine Station have been of great importance. In Great Britain the Brighton Aquarium has long been prominent, and of much service to science. In America the aquarium of the United States Bureau of Fisheries at Washington, D. C., and the New York City Aquarium are worthy of mention. The latter was installed in old Fort Clinton, on the Battery, long known as Castle Garden, where in 1897 it was perfected by Dr. Tarleton Bean. It has seven great floor-tanks, or

pools, and nearly 100 wall-tanks, lighted from above and in the rear, and disposed in two tiers, the upper viewed from a gallery. Both marine and fresh-water fishes and other aquatic animals are displayed, and the mechanical arrangements are of the highest excellence. It is sustained by the city, under the control of the New York Zoölogical Society, and is entirely free to the public. For detailed directions as to the establishment and management of aquaria, see Eggeling and Ehrenberg, *The Fresh-water Aquarium* (New York, 1908).

AQUA'RIOUS (Lat. the water-bearer). The eleventh sign of the zodiac, through which the sun moves in parts of the months of January and February; its conventional symbol is , which is probably intended to represent a stream of water. It is also the name of a zodiacal constellation whose position in the heavens may be found by producing a line in a southerly direction through the stars in the head of Andromeda and the wing of Pegasus.

AQUATIC ANIMALS. See DISTRIBUTION OF ANIMALS.

AQUATIC PLANTS. A term applied to many widely distributed plants that live either wholly or partly in water. Some aquatic plants have their inflorescence, and even part of their foliage, above the surface of the water; others are in water entirely; still others are attached by roots to the bottom. The algæ, which are exclusively aquatic, seem adapted to perform under water all the functions of their life. Aquatic plants are generally of less compact structure than plants belonging to other classes and are therefore better adapted for rising in their growth toward the surface of the water. But many of them, including some of the algæ, are also provided with air-bladders of considerable magnitude, as may be seen in some of the common seaweeds. Some of the more common aquatic plants are shown in the accompanying plate and deserve brief descriptions.

Cat-Tail (*Typha latifolia*), sometimes called bulrush or tule, grows to the height of 5 or 6 feet. Its rootstocks are astringent and diuretic and abound in starch. Its young shoots are much eaten by the Cossacks of the Don and are sometimes used in England under the name of "Cossack asparagus." Its pollen is inflammable and has been used as a substitute for lycopodium.

Long-leaved Pondweed (*Potamogeton lucens*) is one of some 65 species and a number of varieties, included in the genus *Potamogeton*, which belongs to the family Naiadaceæ. The long-leaved pondweed has thin elliptical leaves that float on the surface of ponds or slow streams. It is indigenous to the United States and is found from New Brunswick to Washington and south to Florida and California.

American Lotus (*Nelumbium luteum*), also known as yellow nelumbo, yields edible tubers and seeds. The seeds are sought after by children, and the farinaceous roots are agreeable when boiled. The plant is found as far north as Ontario.

Water Hyacinth (*Eichhornia speciosa*), which belongs to the family Pontederiaceæ, occurs in tropical and subtropical streams of the American continents, being a native of tropical South America, and is widely cultivated in Europe. It is capable of growing on marshy banks, but attains a much larger size when floating on the water, as it usually does, without being attached to the bottom. The rosettes formed by its leaves above

the surface of the water are sometimes no less than two feet high. The rapidity with which they multiply may be seen from the fact that, within a few years after having been introduced for the purpose of beautifying St. John's River, in Florida, they threatened to render navigation on the river an impossibility. Great masses of these plants accumulate along the shores and are often driven by wind and current until they form obstructions extending over the entire breadth of the river, and through which not only small boats, but even paddle-wheel steamers, cannot penetrate. Such obstructions have developed in northern South America and, as already stated, on St. John's River and its tributaries in Florida. An agent of the United States Department of Agriculture, who undertook, in 1897, to investigate the danger thus caused to navigation in Florida, came to the conclusion that perhaps the best way of exterminating the nuisance is to spread among the water hyacinths their natural enemies, the water weeds, or water pests (*Elodea canadensis*); further, to disseminate among them some virulent disease capable of destroying them; and finally, to reconstruct the bridges, so that the mass of obstructing plants may be freely carried out into the ocean.

Common Arrowhead (*Sagittaria latifolia*) is a widely distributed plant with beautiful, white, scentless flowers. It is indigenous to North America, where it extends as far south as Mexico, being found in shallow waters throughout the United States and Canada. The name arrowhead, or *Sagittaria*, is given not only to the common American plant, but to an entire genus of aquatic plants belonging to the family Alismaceæ. The generic name of these plants refers to the shape of their leaves. The plants include natives of both cold and warm climate, and are distinguished by flowers having three herbaceous sepals and three colored petals, with numerous stamens and carpels. This species is also a native of Europe and Asia. The Chinese arrowhead, *Sagittaria sinensis*, has long been cultivated in China and Japan for its edible corms, which abound in starch. It is grown in ditches and in ponds and has arrow-shaped, acute leaves and a branched polygonal scape (leafless stem). A large number of species and varieties of arrowhead are native in American waters.

Water-Lily (*Castalia odorata*), often called the "sweet-scented water-lily," has a large white flower of great beauty and of very sweet smell. Its home is North America. Besides this plant, the name "water-lily" is commonly applied to other species of *Castalia*, as well as to plants of the genera *Nymphaea* and *Nelumbo*, all of which belong to the family Nymphaeaceæ. Great Britain produces three species, viz., *Castalia alba* (the white water-lily), *Nymphaea lutea*, and *Nymphaea minima* (yellow water-lilies); all these have heart-shaped leaves floating on the water, those of the yellow lilies being raised by the stalks a little above the surface. The seeds of these species, as well as those of the water-lily of the Nile (*Nymphaea lotus*), are farinaceous and are sometimes used as food. The stems of *Nymphaea lutea* are used by the Turks in making a refreshing beverage.

Consult: Britton and Brown, *Illustrated Flora of the Northern United States, Canada, and the British Possessions* (New York, 1913). The structural characters of aquatic plants are discussed at some length under HYDROPHYTES. See

also BENTHOS; HALOPHYTES; MANGROVE SWAMP; PLANKTON; SWAMP.

AQUATINT. A variety of etching, the peculiarity of which consists in the resin ground with which the plate is prepared. The outline was first etched in the usual manner (see ETCHING), and the plate cleaned. Then, according to the French, or *dry*, method, the plate was inserted in a box partly filled with powdered resin set in motion by a fan. An even surface having been thus obtained, the plate was heated and the acid applied. The result was a soft background, not unlike that of a mezzotint. Gradations of tone were gained by successive bitings, and white surfaces by the use of varnish. According to the English, or *wet*, method, the plate was treated with a solution of resin dissolved in spirits of wine, the evaporation of which left the resin evenly spread over the plate. Aquatints were printed in black and white, sepia, or in color. The latter effect was obtained by separate printings for each color in France, or partly by printing and partly by hand, as in England. In delicacy of color the aquatint surpasses all prints and could give an almost perfect imitation of water color. The aquatint was invented (or at least perfected) by Jean Baptiste Leprince, a pupil of Boucher. His first plate dates from 1750, the first English print by Paul Sandby from 1775. The greatest of French artists in this medium were François Janinet (1752-1813), Philibert Debucourt (1755-1832), and somewhat later Descourtis, Alix, Morret, Sergent. In England the aquatint flourished somewhat later than in France and was chiefly used in book illustration. The principal English aquatintists were Malton, Stadlet, Bluch, Sutherland, Jukes, Reeve, and Dubourg. A fine example of an English book thus illustrated is David Cox's *Treatise on Landscape Painting and Effect in Water Color* (1814). The collecting of aquatints has in recent years become very popular, and phenomenal prices are paid for good examples. A single print by Debucourt was lately sold for £300. Consult *The Connoisseur*, vol. xxvi (London, 1910).

AQUA TOFANA, tô-fä'nâ (Lat. *aqua*, water, of Tofana; see below). A poisonous liquid described as a clear, colorless, tasteless, and odorless fluid, a few drops of which were sufficient to produce death, which resulted slowly and without pain or fever, under a constant thirst, and weariness of life, and an aversion to food, the strength of the victim diminishing gradually. It is said to have been invented by a Sicilian woman named Tofana, who lived about 1650-1730. She sold the preparation in vials marked "Manna of St. Nicholas of Bari," and it was much sought after by young wives who wished to get rid of their husbands. It is now believed to have been a preparation of arsenic.

AQUAVIVA, ä'kwâ-vê'vâ, CLAUDIO (1543-1615). The fifth general of the Jesuit Order, appointed in 1581, its greatest general and best administrator. He was noted for his attempt to increase the importance and effectiveness of the order through the enforcement of a rigid and uniform system. To this end he wrote *Ratio Studiorum Societatis Jesu* (1586; rev. ed., 1599), and *Directorium Exercitiorum Spiritualium* (1599).

AQUUEDUCT (Lat. *aquæ ductus*, a conduit of water). Broadly speaking, this word means any conduit for conveying water, but usage, both

AQUATIC PLANTS



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1 CAT-TAIL — *TYPHA LATIFOLIA*
2 PONDWEED — *POTAMOGETON LUCENS*
3 AMERICAN LOTUS — *NELUMBIUM LUTEUM*

4 WATER HYACINTH — *EICHHORNIA SPECIOSA*
5 ARROWHEAD — *SAGITTARIA SAGITTIFOLIA*
6 WATER-LILY; POND-LILY — *NYMPHÆA ODORATA*

ancient and modern, has practically limited the word to masonry conduits with little or no more slope than is necessary to cause the water to flow through them by gravity. Such limitations generally exclude mere channels or ditches (canals) in the natural earth, on the one hand, and closed conduits (pipes) under pressure, on the other, except as these form links in an aqueduct of composite type. The masonry portions of some modern aqueducts are under pressure for a part or all of their lengths, and frequently sections of iron or steel pipes under pressure are used to convey the water of an aqueduct beneath a deep valley. Inverted siphons, as these depressed sections are called, are the modern substitute for the aqueduct bridges of earlier days, or for the circuitous routes necessary to avoid the construction of such bridges. Siphons were not unknown to the Romans, who lacked, however, knowledge of cast-iron pipe, or any other pipe of large size, capable of conveying water under heavy pressure. The general abandonment of the masonry aqueduct for conduits or pipe lines of cast or wrought iron, steel and wood, with a consequent diminution in the cost of rights of way, labor, and material, has resulted from a variety of causes, such as shorter routes and smaller conduits. Marked characteristics of the modern aqueducts have been great boldness and freedom in the use of the tunnel, including tunnels under heavy pressure, as in parts of the New Croton, the Catskill, and the Los Angeles aqueducts, and also in the employment of long-span arches for aqueduct bridges, or the substitution of iron or steel (at present the latter) for masonry bridges. In the latest aqueducts bridges have given way almost entirely to tunnels.

Ancient Oriental peoples, such as the Persians and Phœnicians, used a system of subterranean channels of masonry with vertical shafts at intervals, such as Polybius described (x, 23, 3) for Hecatompylos, the capital of the Arsacidæ. The Pelasgic and Mycænæan cities, such as Mycenæ and Argos, were thus supplied. Herodotus describes, as one of the most remarkable works of Greek lands, the aqueduct of Samoas, built by the engineer Eupalinos with a gallery 8 feet square. He also saw at Tyre three aqueducts with arches and viaducts which were imitated at Carthage before the Roman conquest. The early Latin tribes in Italy continued the Pelasgic tradition, as is shown in the famous outlet of the Alban Lake. The water supply of Athens and its plain can still be studied in a variety of conduits and aqueducts earlier than Hadrian's more striking constructions. The custom of subterranean aqueducts was at first also followed by the Romans, whose Appian aqueduct had less than 300 feet supported on arcades above ground. Gradually, with the increase of luxury and the desire to carry the water to the higher hills of Rome, more of the aqueduct was areaded, and the water brought from a greater distance.

The principle of the inverted siphon was used in the aqueducts of Patara, Pergamum, and Aspendos, in Asia Minor, at Constantinople, at Tebessa in Africa, and at Lyons, where it can be studied in great detail; but Vitruvius (vii, 6), in describing this method, warns against it in the case of large volumes of water, whose pressure would not be withstood by the lead or terra-cotta pipes then in use. In a few cases expensive bronze pipe was used to resist pressure.

The careful grading of the aqueduct to prevent a too rapid flow was assisted by curves in the line of construction. This explains apparent peculiarities in direction. Tunnels were often cut, sometimes over three miles long. The fall recommended by Vitruvius is six inches in every 100 feet, but it was usually greater. At the head of the aqueduct a large reservoir, or *piscina*, was established; minor basins were constructed at intervals along the line for filtering and clarifying the water by passing it through gravel. The channel for the water, or *specus*, between 2 and 4 feet wide, and $4\frac{1}{2}$ and $6\frac{1}{2}$ feet high, was originally of stone, lined with hydraulic cement; afterwards of concrete faced with brick. At frequent intervals were blow-holes through the top or sides, to afford ventilation and access to the interior, and their place was taken in the subterranean sections by inspection wells, or *putei*. The channels were large enough to admit the workmen along their entire length for inspection and repair. Leakages were frequent, and the heavy lime incrustations, if not periodically removed, gradually reduced the size of the channels and their carrying capacity. In many cases several water supplies were carried on the same arches, being joined at a certain distance from their source, and each water being usually carried in its separate channel. This is the case with the Marcia, which carries also the Tepula and the Julia.

At the city end of the aqueduct a capacious reservoir was constructed called a *castellum aquarum*, where the water was cleared by passing through several chambers and from which it was then distributed over the city. These *castella* were sometimes, as in the case of the Claudia and the Alexandrina, at Rome, important artistic structures. Here there were separate purifying and storing compartments for each class of structures supplied; in the Republican period there were only three—public fountains, baths, and private houses. But under the Empire the subdivision became much more elaborate. Certain very large single buildings, such as baths, had separate reservoirs. The water was carried into buildings by lead pipes through an official bronze joint stamped with its exact capacity and serving as a meter. The conservation and regulation of the water supply, the exact allowance to individuals, corporations, and public buildings, was secured by a very careful administration. This care was not only applied in Rome itself, but was coextensive with the entire line of aqueduct as it was tapped at intervals and used by towns, settlements, and private owners for drinking and irrigation. To assist the administration, a strip of land 30 feet wide was reserved along the entire course, as government property, and marked by boundary stones at intervals of 240 feet. The administration was under the care of the censors, and then of the quæstors and ædiles; but under Augustus the bureau was better organized, and put in charge of a *Curator Aquarum*, with his two assistants, his clerks, his consulting engineer, and his various classes of officials and of artisans comprising a *familia* of slaves: ushers, lictors, and criers, as well as pipe-layers, pavers, masons, levelers, measurers, inspectors, reservoir keepers, etc. As usual with Roman buildings, the aqueducts were built by contract, and the use of unskilled labor made their cost relatively small. The Appia is said to have cost

\$675,000. The repairing of the Appia and Anio Vetus, and building of the Marcia in 144–140 B.C., cost only about \$850,000. Under the more lavish Empire the Claudia and the Anio Novus cost about \$4,000,000, but none of the others were as expensive as these.

ROMAN AQUEDUCTS

Among the Roman aqueducts those of Rome itself possess the greatest interest, because of their number, length, and boldness of design and execution. Two of them, in fact, are still in use, and water from the very source that supplied one of them (Marcia), restored in 1869, is now delivered to the city through a modern water-works system. Not only are they in remarkable preservation, but, most happily for engineers and archæologists alike, they are described in some detail by a Roman engineer who was water commissioner of Rome in 97 A.D., named Sextus Julius Frontinus, in his *Two Books on the Water Supply of Rome*. This work was first made available to English readers in 1899, through a translation by Clemens Herschel, an American hydraulic engineer, who gives not only the Latin text, but also a photographic reproduction of the oldest Latin MS. in existence, in the library of the Benedictine monastery at Monte Cassino. Besides all this, the book in question contains several chapters of comment by the translator, both on the aqueducts and the water supply of Rome in general. Mr. Herschel concludes that the capacity of the ancient Roman aqueducts has been greatly over-rated, and that, instead of the 400,000,000 gallons a day given by some writers, based on Frontinus's calculations, "thirty-eight million gallons one day with another" is "a fair estimate at which to set the water supply within the walls of ancient Rome in 97 A.D., though the total ranged, no doubt, some 20,000,000 gallons per day either side of that mark from time to time. This would make about 38 gallons per day per inhabitant, which is still a very large figure when use alone, not waste, is taken into account; and when, further, we consider that by far the greater part of the people undoubtedly used only such water as was carried to their homes in jars on the heads of slaves and other women." Still, Frontinus describes nine aqueducts in use in his day, the main facts regarding which may be summarized as follows:

1. *Aqua Appia*, built by and named after the censor, Appius Claudius, in 312 B.C. Its springs were between the sixth and seventh milestones from Rome, and its course was about 11 miles long. All but 300 feet was underground. The exact size of its channel is uncertain, but is given by several authors as about 2.5 feet wide and 5 feet high in the clear.

2. *Anio Vetus*, constructed 272–270 B.C. by M. Curius Dentatus and Fulvius Flaccus. All but 1100 feet was underground. Remains may be traced both near Tivoli and near the Porta Maggiore. Its water is taken from the river Anio, about the twentieth milestone, 3 miles beyond Tivoli, and its course, which is very circuitous, is about 43 miles long. It was about 3.7 feet wide and 8 feet high inside, of heavy masonry of peperino stone, plastered on the inside.

3. *Aqua Marcia*, named after the prætor, Quintus Marcius Rex, 144–140 B.C., had its source in springs between Tivoli and Subiaco, near the

thirty-sixth milestone from Rome, was over 62 miles long, and carried into the city 195 feet above sea level, so as to reach the top of the Capitol. Near its head it is 5.7 feet wide and 8.3 feet high, and farther on it is 3×5.7 feet. This and the two preceding aqueducts were built of rough-hewn dimension stone, $18 \times 18 \times 42$ inches, or more, while the later ones, except Claudia, were of concrete and brick. The greater part of Marcia was underground, but there were some long stretches on arches—over 7 miles—some of which are still standing and bear parts of two and three other aqueducts (Anio Vetus, Claudia, and Anio Novus) above them. This is especially the case near Tivoli, where there are superb viaducts and bridges alternating with tunnels. There are about 6 miles of arcades near Rome.

4. *Aqua Tepula*, 125 B.C., leading from springs on the slopes of the Monti Albani, had at first an independent channel, on the arcades of the Marcia, 6 feet above it, or 201 feet above sea level. It was 2.7 feet wide by 3.3 feet high, and commenced not far from the eleventh milestone.

5. *Aqua Julia*, the first imperial aqueduct, constructed by M. Agrippa, under Augustus, in 33 B.C., took water from springs near the source of Tepula (twelfth milestone), and was mixed with the latter to cool it, and entered Rome on the arcades of the Marcia, about 212 feet above sea level. Its channel was 2.3 feet wide and 4.6 feet high. Portions of Marcia, Tepula, and Julia, one above the other, are still in existence at Porta Tiburtina.

6. *Aqua Virgo*, 19 B.C., also constructed by Agrippa. Aqua Vergine, as it is now called, is still entire, having been restored by Popes Nicholas V and Pius IV. The source of the Aqua Virgo is near the eighth milestone, only 80 feet above sea level; its channel was 14 miles long, and it entered the city 13 feet lower. The channel was about 1.6 feet wide and 6.6 feet high. It still supplies the famous Trevi fountain and others.

7. *Aqua Alsietina*, about 10 A.D., constructed by Augustus, now called the Aqua Paola, starts at a pond near the fourteenth milestone, and supplies the fountains in front of St. Peter's and the Fontana Paola, on the Montorio. Its original object was irrigation, and the supply of the Naumachia of Augustus, which was a sheet of water for the representation of sea fights. Its water, which was undrinkable, reached Rome in a channel 24 miles long, about 55 feet above the sea, the lowest level of any.

8. *Aqua Claudia*, 38–52 A.D., commenced by Caligula and completed by Claudius, starts near the thirty-eighth milestone and is about 45 miles long. Its line of nearly 10 miles of magnificent arches still stretches across the Campagna and forms one of the grandest of Roman ruins. At its upper end its channel was 3.3 feet wide and 6.6 feet high. When it reaches the Campagna, it carries the Anio Novus (see below), the lower aqueduct being of dimension stone and the upper of brick, lined with concrete. The water of these two aqueducts reached the Palatine 185 feet above the sea; but at Porta Maggiore the water in Anio Novus was at an elevation of 230 feet and Claudia 9 feet lower.

9. *Anio Novus*, also 38–52 A.D., was nearly 62 miles long, thus being the longest of the aqueducts, and starting at the Anio, near the thirty-eighth milestone. Its channel had a width of 3.3 feet and a height of 9 feet. Some of its arches

are over 100 feet high, and its ruins are as superb as those of the Claudia, the two combining before entering Rome.

10. *Aqua Trajana*, built in 109 A.D., started at Lake Bracciano, was about 40 miles long, followed nearly the same route as *Aqua Alsietina*, and its waters join to form the supply of the present *Aqua Paola*. It was used for supplying the Janiculum and the Trastevere.

11. In 226 A.D. an eleventh and last aqueduct was built, called *Aqua Alexandrina*, to supply the Campus Martius. The other aqueducts sometimes credited to old Rome were probably branches of some of the eleven.

Although stone continued in use for aqueducts under the Empire, concrete with *opus reticulatum* and concrete with brick were used both in various parts of Italy and even in Rome itself, especially in the *Aqua Alexandrina* and Nero's additions to the Claudia. There remain many imposing Roman aqueducts in different parts of the Empire. The high viaducts and bridges in France, such as those near Nîmes, Cahors, and Lyons; in Spain at Segovia, Mérida, and Tarragona; at Constantinople, at Beirut, at Cherchel, and Carthage are especially imposing—higher and bolder than anything at Rome; some have two, some three superposed stories of arcades, with a total height of between 100 and 300 feet. The Pont du Gard and the aqueduct of Segovia are the finest in existence. The stonework in the provinces is even superior to the average in Rome. The following examples may be mentioned: *Italy*: Minturnæ (fine *opus reticulatum*, very decorative), Genoa (very early, c.210 B.C.), Puteoli, Pompeii, Termini in Sicily. *Gaul*: Nîmes (Pont du Gard), Lyons (4 aqueducts in *opus reticulatum*, with siphons and bridges), Metz (with a great bridge of 114 arches), Paris (3 aqueducts of late Roman date), Frejus (a superb example, built under Claudius, 30 miles long, with many arcades), Antibes (2 aqueducts, one still in use), Arles, Marseilles, Aix, Vienne, Autun, Besançon, Poitiers (4), Cahors (a superb three-storied viaduct), Toulouse, and many others. *Germany*: Mainz, Treves, Cologne, Solicinum, Windisch. *Spain*: Segovia (built under Trajan, 12 miles long, with a superb viaduct of 119 arcades, 818 yards long, in two stories), Tarragona (built in the Republican Period, c.210 B.C., 6 miles long, with magnificent two-storied viaduct of 11 and 25 arches), Chelva, Seville, Mérida (2 aqueducts, one still in use; the other by Augustus, with a viaduct of three stories), Consuegra, Calahorra. *Portugal*: Elvas, Evora, Beja. *Africa*: Tebessa, Constantine (3), Tipasa, Cherchel (Cæsarea), Orléansville, Carthage (Punic and Roman), Makter (with a viaduct). *Asia*: Anzarba, Beirut (with a bridge), Palmyra, Baalbek, Petra, Sinope, Nicomedia, Antioch, etc.

The Oriental provinces of the Empire, preserving Greek engineering traditions, were more scientific, as shown by frequent use of siphons. The Byzantine emperors continued the Roman traditions, as shown by the aqueducts of Valens and Justinian at Constantinople, in connection with which are the wonderful cistern-reservoirs in the city with their forests of columns. Adana, Mopsuestia, and many other Eastern cities were provided by Justinian with aqueducts. The Gothic kings attempted the same, as in the extremely bold viaduct at Spoleto, loftier than any Roman work; their work in Spain was continued by the Moors, as at Elvas. The Mohammedans

throughout the East continued the construction of aqueducts; but the Middle Ages in Europe were comparatively inactive in this branch of engineering. The Gothic aqueduct at Solmona and that at Coutances are perhaps the finest in Europe of this age. The Renaissance renewed the art, beginning with the Roman popes of the sixteenth century. France soon followed suit, as in the aqueduct of Arcueil at Paris built for Marie de' Medici, in 1613, and that of Maintenon under Louis XIV. In 1753 Charles III built the great aqueduct of Caserta, about 30 miles long. The aqueduct of Marseilles, begun in 1847 and over 40 miles long, with 75 tunnels and several viaducts, is the only work of modern engineering construction comparable artistically to the Roman; it could have been built for a fraction of the cost (\$1,200,000) by using siphons.

MODERN EUROPEAN AQUEDUCTS

Among the European aqueducts constructed during the latter part of the nineteenth century may be mentioned, first, that conveying water from Loch Katrine to Glasgow, built in 1855-60. This has been supplemented by a short connection with Loch Arklet, and connections with other lochs were projected in 1913. The new water-supply conduits of Manchester and Liverpool, built in 1881-92 and 1885-94, respectively, are partly masonry structures and partly pipe lines. The Liverpool supply is brought from Lake Vyrnwy, a distance of 68 miles, partly in tunnel. The Manchester supply comes from Lake Thirlmere, a distance of nearly 96 miles, through 36 miles of concrete conduit and 14½ miles of tunnel, making 50½ miles of masonry aqueduct, and through 45 miles of iron pipe. The largest tunnel is 8½ miles in length, and the longest inverted siphon, of iron pipe, is about the same length. Another inverted siphon is under a head of 480 feet. The masonry aqueduct is 7 feet in diameter. Since their original construction the three aqueducts just named have been brought up to their full or more than their full capacities, as originally designed, by duplicate and in some cases triplicate conduits, for the whole or portions of their length.

Vienna, Austria, completed a 55-mile aqueduct in 1873 and later extended it to 65 miles to gain more water. It has a carrying capacity of 36,500,000 gallons and a total fall of 985 feet, a large part of which is in a series of drops in the first 10 miles of the original construction. These drops, with gates, were designed to keep the aqueduct from being under pressure. After the drops, most of the aqueduct is in tunnel. The first Kaiser-Franz-Joseph Aqueduct, as it was called, becoming inadequate, plans for a second one of the same name were made about 1899 and had been nearly executed in 1910. It is 114 miles long and takes in six mountain streams, the highest being 1658 feet above the city. Its capacity is 55,000,000 gallons a day. Of its total length 44 miles are in rock or earth tunnel, apparently lined with concrete. The longest tunnel is 17,630 feet. Valleys are crossed by inverted siphons of cast-iron pipe, one of which is about 6 miles long, besides which there is at least one masonry arched bridge crossing. The typical tunnel sections are of horseshoe shape, about 7 feet high and 6½ feet wide, with a water depth of about 5½ feet. In some places the arch of the rock tunnel was left unlined.

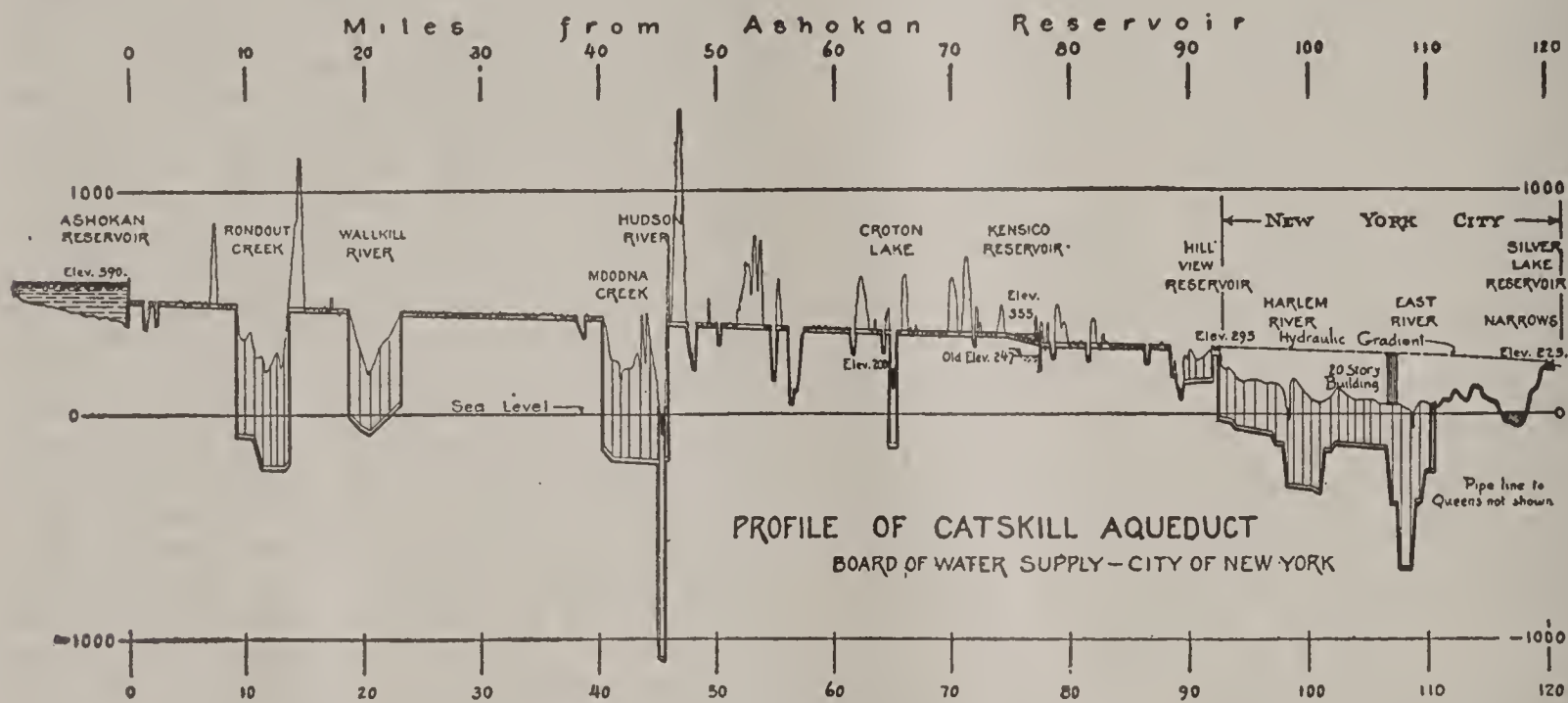
AMERICAN AQUEDUCTS

In the United States notable aqueducts were completed by New York in 1842 and a second in 1890 (Old and New Croton); Boston in 1848 and a second in 1878; Brooklyn in 1859; Baltimore in 1862 and a second in 1880; Washington in 1863, with a second one begun in 1883, abandoned before fully completed and finally put in use in January, 1902; St. Louis, Mo., about 1893; the Metropolitan Water Board (Boston and surrounding towns) in 1897; and Jersey City, put in use in 1904 (on this work masonry aqueducts and tunnels are used only where steel pipe lines are not available). In 1913 New York City had nearly completed a third aqueduct, larger and longer than the two earlier ones, and Los Angeles, Cal., completed the longest aqueduct as distinguished from a pipe line, ever yet undertaken.

Cast-iron, steel, or wood pipe is used in place of masonry for nearly all American aqueducts, especially since the introduction of riveted steel pipes; and where masonry is used the trend of

was designed to carry 72,000,000 gallons a day. In 1865 the portion of aqueduct below 92d Street was replaced by two 72-inch cast-iron pipes, for which three 48-inch pipes were substituted later on. In 1870 another length of aqueduct within the city was replaced by six parallel lines of 48-inch cast-iron pipe, $\frac{3}{4}$ mile long. This aqueduct was carried as near the surface as the grades would permit.

The *New Croton Aqueduct*, like the old one, begins at Croton Lake, formed by a dam on the Croton River, and extends to 135th Street, New York City. Its total length is 30.75 miles, or 33.10 miles if the pipe line extension to the Central Park reservoir is included. Of the masonry aqueduct, 29.63 miles is in tunnel, requiring shafts from 18 to 402 feet deep for its construction. About 7 miles of the tunnel is under pressure, including the crossing beneath the Harlem River, where there is a pressure of 55 pounds when full. Most of the pressure tunnel is $12\frac{1}{3}$ feet in diameter, but under the Harlem, where the masonry is lined with cast iron, the diameter is only $10\frac{1}{2}$ feet. In general the aqueduct is shaped like a horse-



PROFILE OF THE CATSKILL AQUEDUCT.

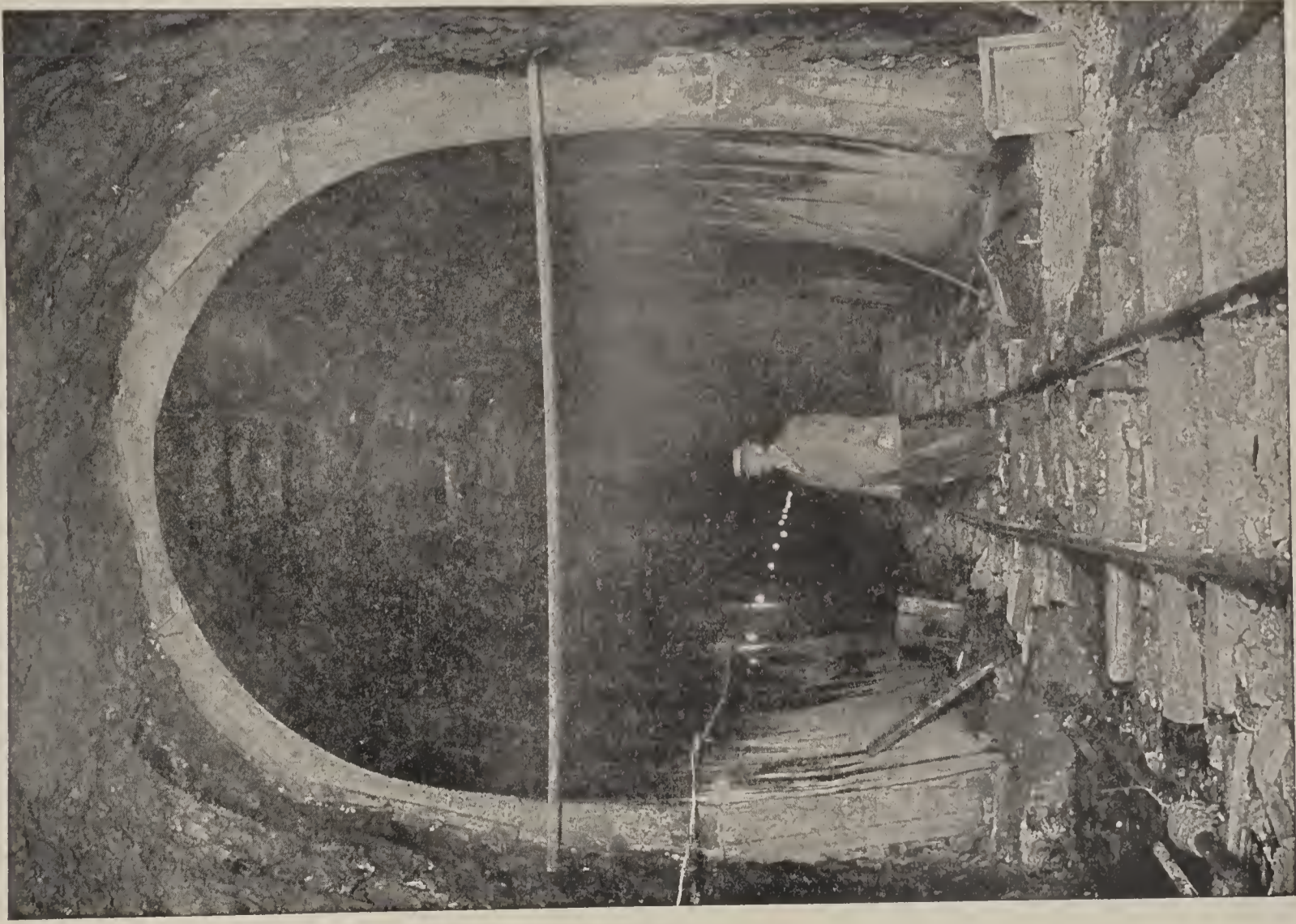
the latest practice is to employ concrete, either alone or reinforced by steel rods, wire, or expanded metal. The steel is imbedded in the concrete, and since it can resist high tensile strains, aqueducts of reinforced concrete may be subjected to pressure. Reinforced concrete was employed on the Jersey City aqueduct.

The *Old Croton Aqueduct*, supplying New York City, has a total length of 38.1 miles and a total fall of 43.7 feet, the ordinary grade being 1.1088 feet per mile. It is of brick-lined masonry, the bottom being an inverted arch of 6.75 feet chord, 0.75 feet versed sine; sides, 4 feet high, battered to 7.42 feet apart at top; covered with semicircular arch, giving total interior height of 8.64 feet and cross-sectional area of 53.34 square feet. The Harlem River is crossed on a granite masonry arched bridge, 100 feet high in the clear, and about 1400 feet long, the water being conveyed in two 36-inch cast-iron pipes and one $90\frac{1}{2}$ -inch wrought-iron pipe, the latter added in 1860. The Manhattan valley is crossed by inverted cast-iron pipe siphons, two miles long, the original two 36-inch pipes being supplemented by a 48-inch in 1853 and a 60-inch in 1861, the latter being reported as the largest iron pipe cast up to that time. The aqueduct

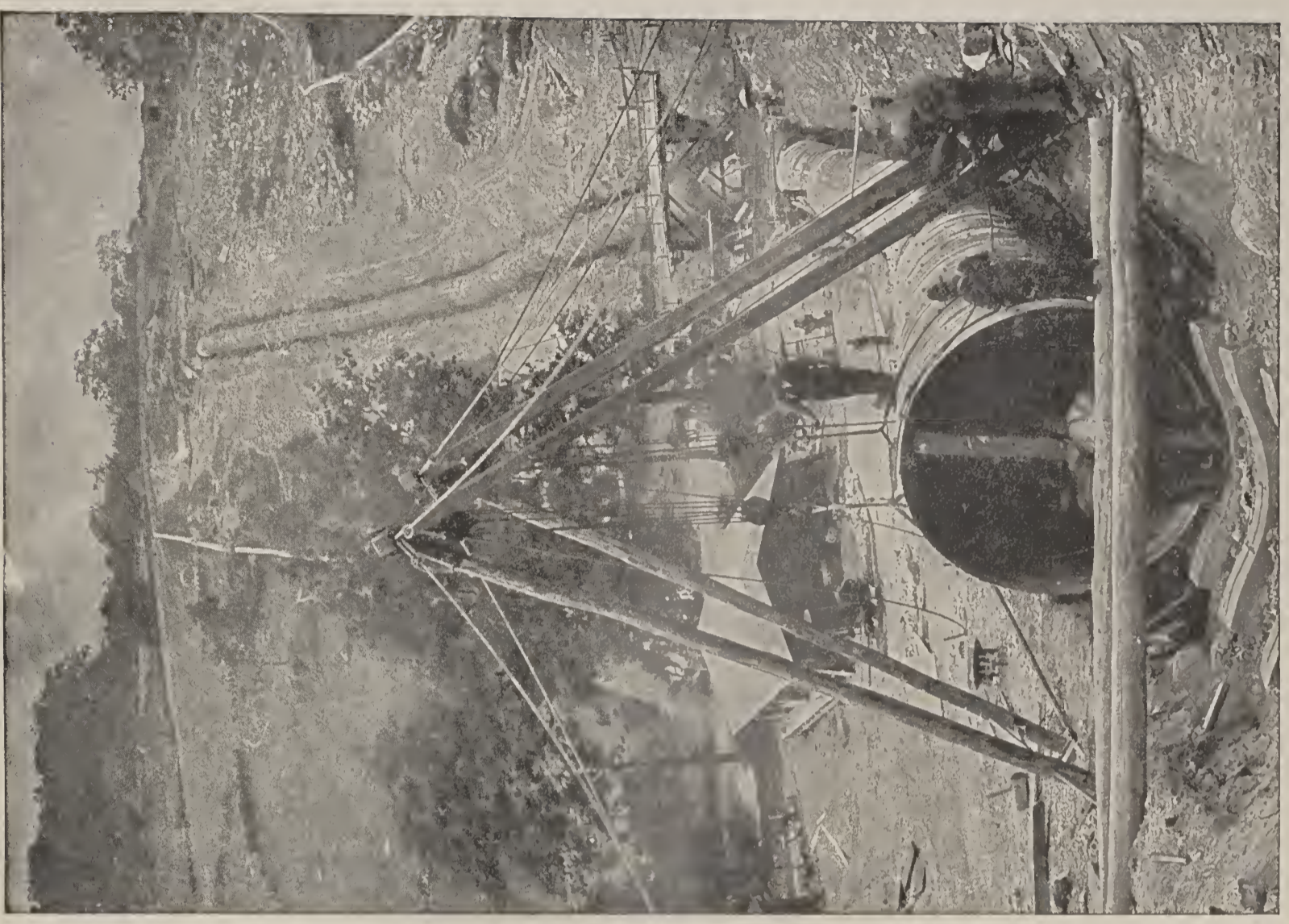
shoe, 13.53 feet high and 13.6 feet wide, has a fall of 0.7 foot per mile and an original rated carrying capacity (see below) of about 318,000,000 gallons a day. At the Jerome Park storage reservoir, in the north part of the city, and some 23 miles from the upper end, it is reduced to a rated capacity of 250,000,000 gallons a day and changed to a circular section, $12\frac{1}{4}$ feet in diameter, for over 6 miles. The cost of the aqueduct varied from \$89.98 to \$123.25 per lineal foot in different sections and under varying conditions. When the New Croton Aqueduct was designed, it was estimated that it would carry 318,000,000 gallons a day, while flowing to a depth of 12.842 feet in the horseshoe sections. Gaugings after its completion fixed the carrying capacity at about 302,500,000 gallons. Careful studies made by John R. Freeman in 1899 (*Report upon New York's Water Supply*, New York, 1900) led him to conclude that the aqueduct was then carrying 16 per cent less for stated depths than shown by the earlier gaugings, part of the difference being due to deterioration of the inner surface.

The *Catskill Aqueduct*, designed ultimately to furnish New York City with an additional water supply of 500,000,000 gallons a day from streams

AQUEDUCTS



TYPICAL GRADE TUNNEL ON THE LINE OF THE AQUEDUCT. BONTICOU
GRADE TUNNEL 17 FEET HIGH, 13 FEET, 4 INCHES WIDE, END
OF COMPLETED CONCRETE ARCH LINING; COMPLETE
INVERT REMAINS TO BE LAID



THE CATSKILL AQUEDUCT

HUNTER'S BROOK STEEL-PIPE SIPHON. ERECTING STEEL-PIPE ON CON-
CRETE CRADLES PREVIOUSLY PLACED. PIPE WILL BE IMBEDDED IN
CONCRETE AND BACK-FILLED WITH EARTH AND LINED WITH
2 INCHES OF PORTLAND CEMENT MORTAR

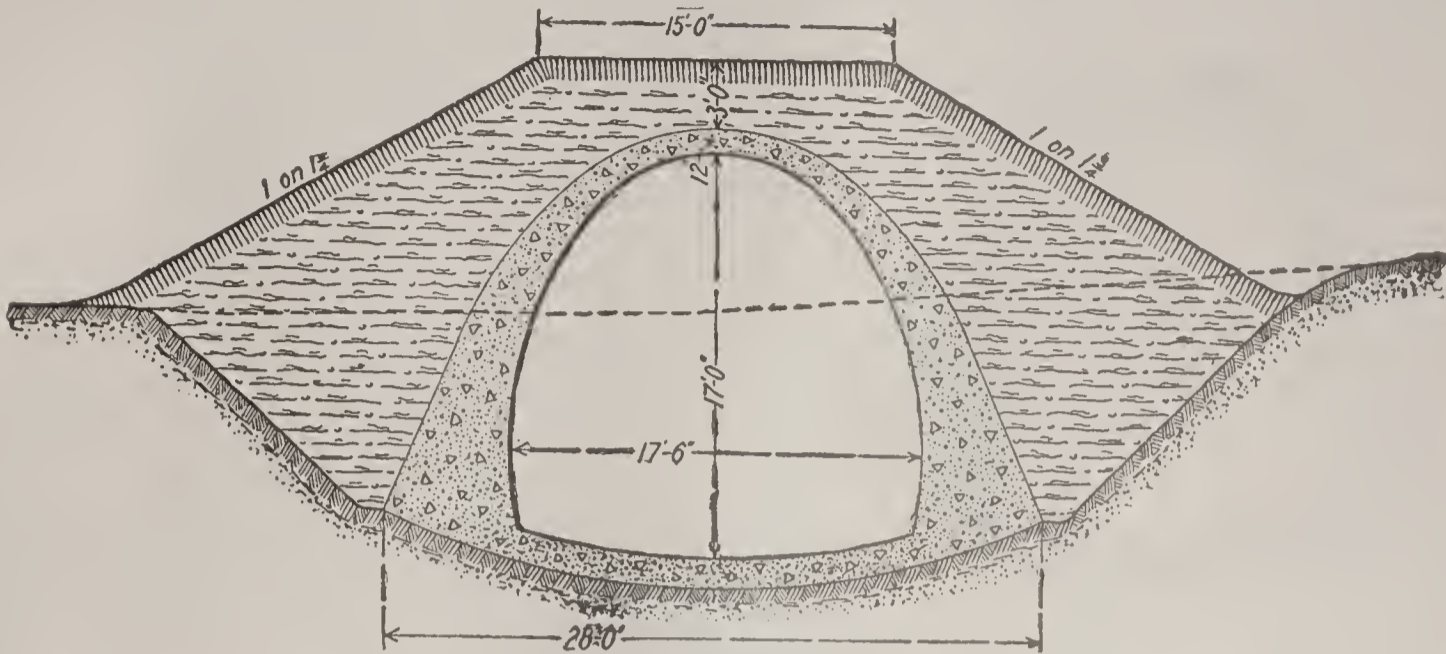
AQUEDUCTS



THE CATSKILL AQUEDUCT
CROSS-SECTION SHOWING SIPHON CROSSING THE HUDSON RIVER AT STORM KING

in the Catskill Mountains, west of the Hudson River, was put under construction late in 1906 and was practically finished in 1913, but some of the accessory reservoir work was not to be completed until about 1920. The aqueduct proper is 92 miles long, beyond which first a

The fourth type of Catskill Aqueduct includes 7 so-called inverted siphons, 6 miles in aggregate length. These are steel pipe, 9 and 11 feet in diameter, $\frac{7}{16}$ to $\frac{3}{4}$ -inch thick, lined with 2 inches of cement mortar and covered outside with concrete, the whole in an earth



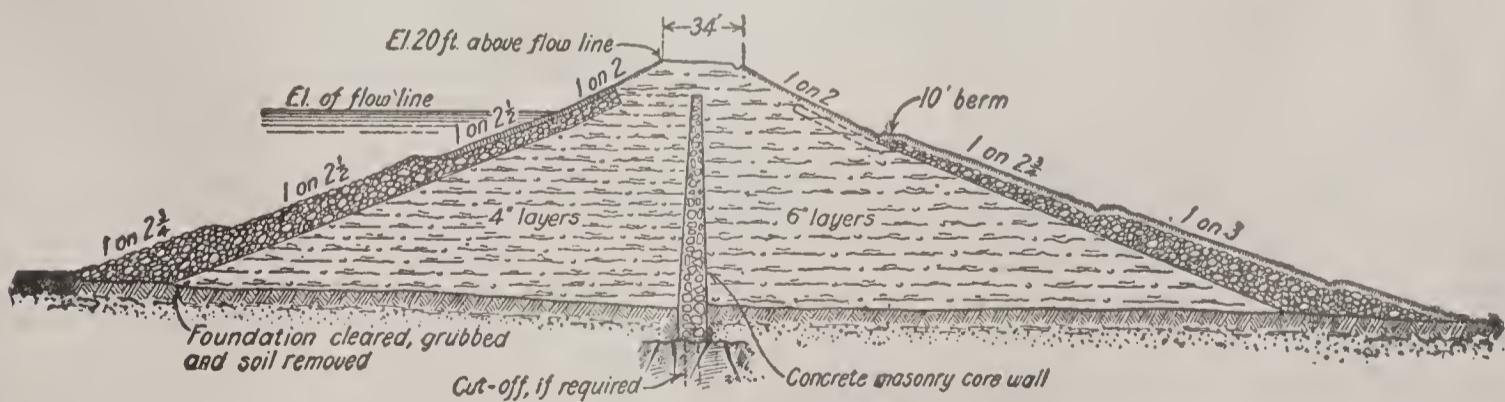
CUT AND COVER SECTION CATSKILL AQUEDUCT.

tunnel and then pipe lines extend to a total length of 34 miles, including branches, to connect with various parts of the city pipe distribution system. The aqueduct extends from the Ashokan impounding and storage reservoir to the Kensico storage reservoir, 30 miles north of the City Hall in New York, and on to the Hill View storage and equalizing reservoir near the Yonkers-New York City line, some 15 miles from the City Hall. At the outset the aqueduct will carry some 250,000,000 gallons, but later on other streams and impounding reservoirs will be made tributary to it, thus utilizing its full capacity. Over 25 per cent of the length of the aqueduct is under pressure, including a number of deep tunnels, driven from vertical shafts through rock.

The most remarkable of these tunnels is the one beneath the Hudson River, a few miles from West Point. This tunnel is 1100 feet below the surface, 3022 feet from shaft to shaft. The shafts and tunnel are lined with concrete and have a finished diameter of 14 feet. Of its length of 92 miles, 55 miles of the Catskill Aqueduct are of the cut-and-cover type, horse-shoe-shaped, 17 feet high and 17½ feet wide, the maximum size, built of concrete. These por-

embankment. There will be three pipes side by side, but for the present only one is being built; elsewhere the aqueduct is of full capacity from the start. Three of the largest Venturi meters (q.v.) in the world are built into the Catskill Aqueduct at different points. Each is 410 feet long, and entirely of reinforced concrete, except for the bronze throats and piezometer rings.

From the Hill View reservoir the City Aqueduct system will convey water to the five boroughs of New York City. For the first 17½ miles this is a pressure tunnel 15 to 11 feet in diameter, in solid rock at depths of 200 to 750 feet below the surface. The 24 vertical shafts for driving the tunnel and affording connection with the trunk water distributing mains in the city streets are lined with concrete, as is the length of the tunnel. The city aqueduct tunnel goes beneath the Harlem River, Manhattan Island, and the East River into Brooklyn. Cast-iron and steel pipe extend from the Brooklyn end of the tunnel to supply Brooklyn, Queens, and Richmond boroughs. To reach the latter (Staten Island) a cast-iron pipe will be laid on the bed of the Narrows. There will be



TYPICAL SECTION OF ASHOKAN DIKE.

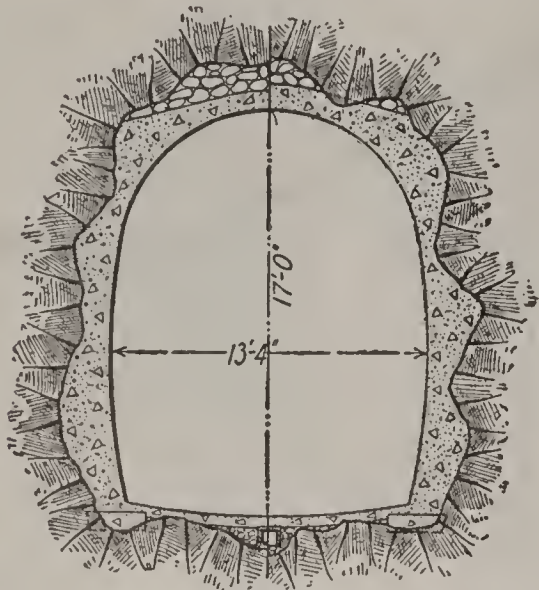
tions are not under pressure, nor are the 24 grade tunnels, aggregating 14 miles in length, horseshoe in shape, 17 feet high and 13½ feet wide, also lined with concrete. Besides the grade tunnels there are 7 deep concrete-lined pressure tunnels, totalling 17 miles in length, about 14 feet in diameter.

a terminal storage reservoir on Staten Island. The city aqueduct and pipe system and terminal reservoir will cost \$25,000,000. The cost of the aqueduct proper, including reservoirs, was estimated at \$162,000,000 in 1905.

The Catskill Aqueduct crosses beneath the New Croton Reservoir and thus can be used to

supply water through either the Old or New Croton aqueducts.

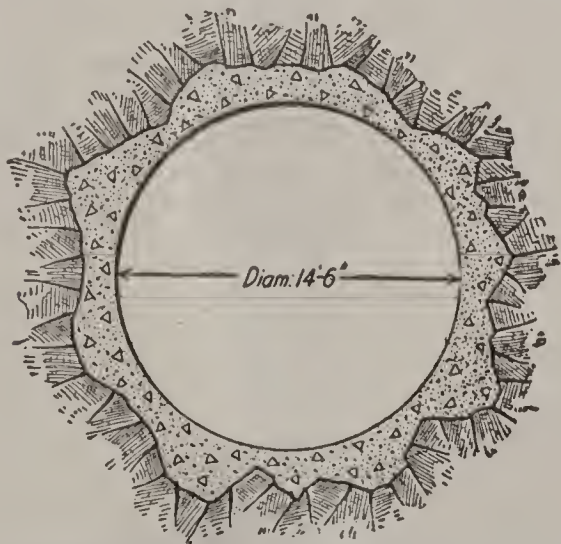
The *Wachusett Aqueduct* for Boston and vicinity has a rated daily capacity of 300,000,000 gallons. It is 12 miles long, if the 3 miles of canal at its lower end are included, and leads from the site of a handsome masonry dam on



GRADE TUNNEL, CATSKILL AQUEDUCT.

the Nashua River, at Clinton, Mass., to the Sudbury reservoir, a part of the old Boston water works, now controlled by the Metropolitan Water Board. The first two miles of the *Wachusett Aqueduct* is in tunnel, through rock so compact that about one-half of it required no lining. After the tunnel come 7 miles of aqueduct proper, built in embankment or in excavation. Both tunnel and covered aqueduct are built in the general shape of a horseshoe, from 11½ to 13½ feet wide and from 10½ to 11 feet 10 inches high, and are of concrete, with the lower portion lined with one course of brick. Below the section just described there are 3 miles of open channel or canal. The aqueduct is carried over the Assabet River on a handsome granite masonry bridge of seven 29½-foot spans.

The *Cabin John Arch*, which carries the first Washington aqueduct across a creek of the same name, was for many years the largest single-



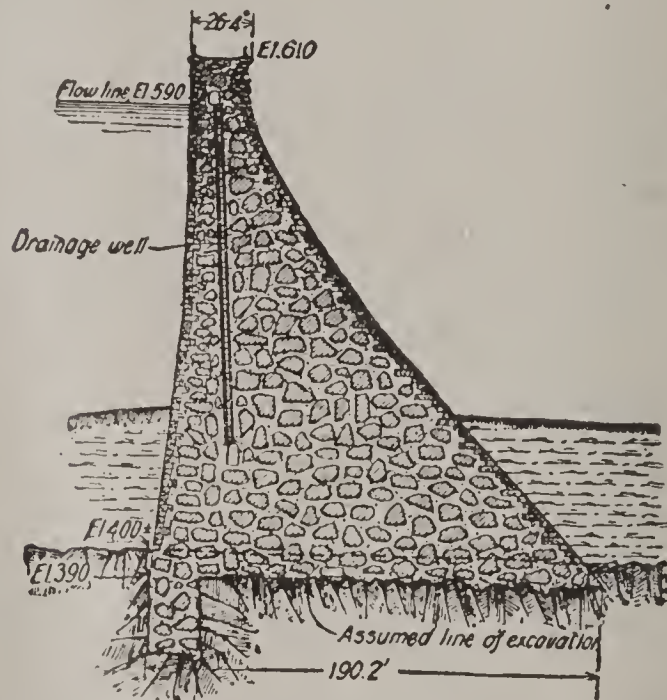
SECTION OF PRESSURE TUNNEL, CATSKILL AQUEDUCT.

span masonry bridge in the world, having a length of 220 feet and rising to a height of 101 feet in the clear. The rise of the arch, from the spring line, is 57½ feet. The bridge is 20 feet wide, and its total length is 420 feet. It was built of large granite blocks, with sandstone parapets and coping. It cost \$237,000.

The *Los Angeles Aqueduct* was begun in 1907, completed in 1913, and was to go into operation in 1914, on the completion of a connecting pipe

line between its lower end and the city of Los Angeles, Cal. It is approximately 235 miles long, including 8.5 miles of reservoir flow and some 10 miles of power canal. It has a rated capacity of 259,000,000 gallons a day, only a small part of which will be needed to supplement the existing supply. It was proposed to use the surplus to irrigate some 135,000 acres of land near the city until it was needed for domestic consumption. The aqueduct will divert the entire flow of the Owens River, through an intake 11 miles north of Independence, Cal., near the foot of Mount Whitney (Sierra Nevada Mountains), the highest peak in the United States proper. The intake is at elevation 3812 feet above sea level, and as the business section of Los Angeles is some 275 feet above sea level, the highest parts of the city can be supplied by gravity after allowing for friction losses in the aqueduct and pipe line below it, and still leave many hundred feet fall available for power.

By keeping the aqueduct at the hydraulic grade for as great a distance from the intake as was feasible the head of water is conserved and brought relatively near the city, where the

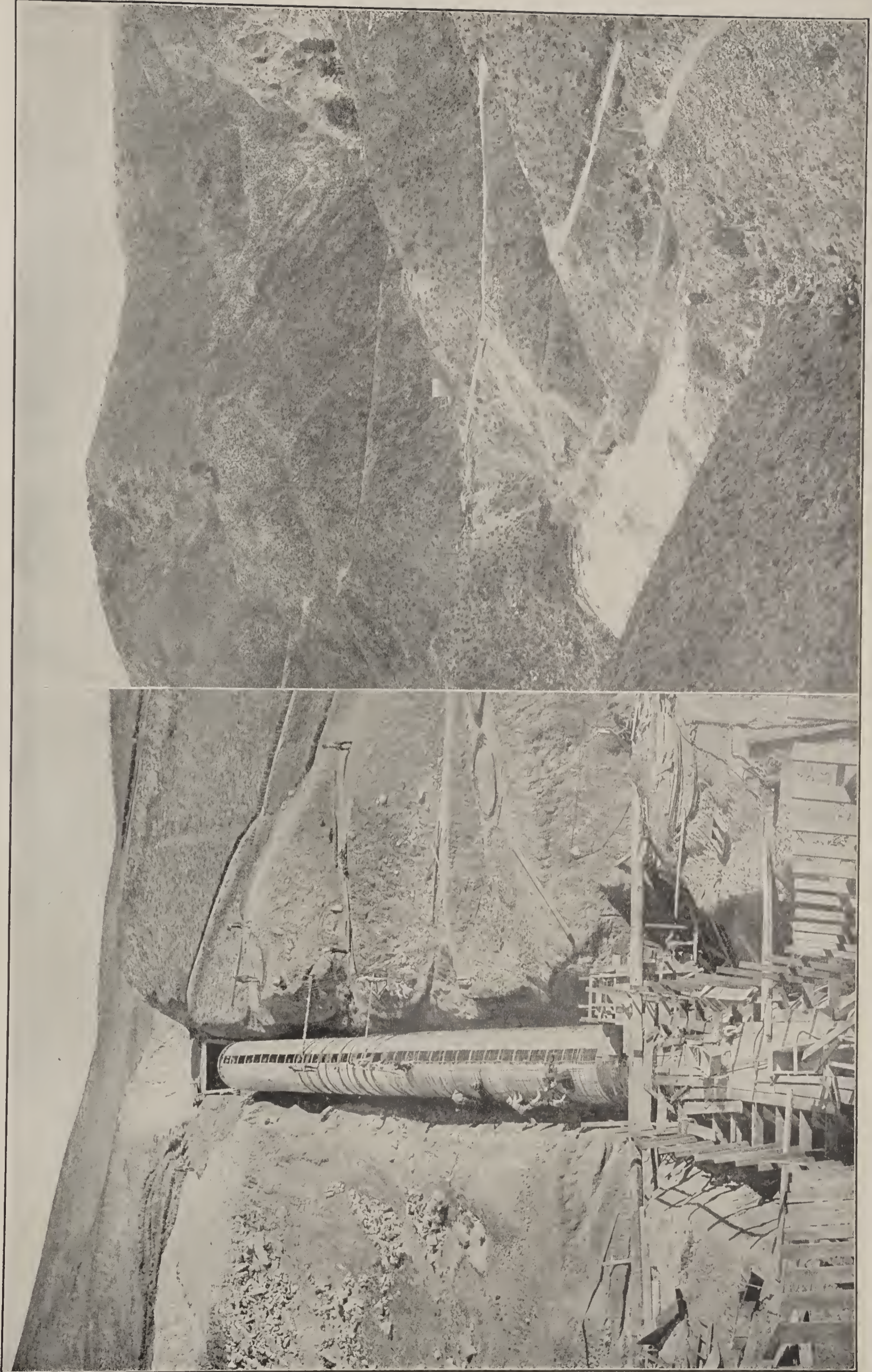


OLIVE BRIDGE DAM — MAXIMUM MASONRY SECTION.

inevitable drop is to be utilized to develop, ultimately, 120,000 horse power of electrical energy, which will be transmitted to Los Angeles for sale for light and power purposes or for use by the city itself. Hydro-electric generators of nearly 40,000 horse power were under construction in 1913. There are several storage reservoirs along the line of the aqueduct, and in 1913 one was under construction and another projected at its lower end. The lower of these terminal reservoirs has its water surface at 1135 feet above sea level. The aqueduct is notable (1) for its great length, (2) on account of the construction difficulties involved, and (3) because it was built, including a large cement plant and an extensive telephone system, almost wholly by the city (i.e., without contractors).

The aqueduct crosses a long stretch of the Mojave Desert and extends for miles along mountain sides, through mountains, across valleys. For much of its distance it is remote from railways and sources of water supply, requiring long hauls of heavy material by wagon and the construction of several hundred miles of pipe lines for temporary water supply. The first 21 miles of the aqueduct is an unlined canal, 59 feet wide at the water depth of 7 feet. Then

AQUEDUCTS



LOS ANGELES AQUEDUCT

THE ELLSMERE SIPHON. Built of concrete strongly reinforced with steel. View shows the forms arranged for the concrete and the reinforcing

A DEEP DEPRESSION ON THE JAWBONE DIVISION CROSSED BY STEEL PIPE LINE. View shows typical topography and construction difficulties involved

AQUEDUCTS



A section of the Antelope siphon showing steel pipe ten feet in diameter.



One of the aqueduct tunnels in the Langas division.



Open concrete lined ditch above Haiwee Reservoir.

come about 40 miles of concrete, lined open ditch, 30 feet wide at the water surface, with slopes 1 to 1 for a water depth of 10 feet, below which there is a curved bottom $1\frac{1}{2}$ feet deep in the centre. For the remaining distance the aqueduct is closed, sometimes on the hydraulic grade and sometimes under pressure, with various types of construction. Altogether there are about 98 miles of covered conduit, with concrete or reinforced-concrete bottom and sides and reinforced-concrete covers, flatwise. There are also about 43 miles of concrete-lined tunnels, some of which are under pressure, and 12 miles of inverted siphons of either riveted steel plates or reinforced concrete. The concrete-lined-and-covered portions generally have curved bottoms and slightly battered sides. One of the maximum cross-sections of this type has a curved bottom 10 feet wide and 1 foot deep; sides battering 1 on 12 and a water depth of about 9 feet. One of the principal tunnels is of horse-shoe shape, 10 feet 10 inches high and $9\frac{1}{2}$ feet wide. The standard reinforced-concrete siphons are $10\frac{3}{4}$ feet in diameter. The jawbone steel siphon is from 10 to $7\frac{1}{2}$ feet in diameter, 8000 feet long, under a maximum head of 850 feet, and is composed of plates $\frac{1}{4}$ to $1\frac{1}{8}$ inches thick.

In round numbers the Los Angeles Aqueduct was estimated to cost \$25,000,000, including the reservoirs undertaken up to 1914 and land and water rights, but not including power development, nor the 13 miles of 72-inch to 62-inch steel pipe line from the lower reservoir to the city, nor the trunk lines for proposed irrigation service. Approximately \$12,000,000 was expended for labor, with an average wage of \$2.75 per day of eight hours and a minimum of \$2.25. Rights of way and lands cost \$7,000,000, and freight, live stock, electrical energy, etc, \$1,500,000. Detailed descriptions of the work appeared in the engineering press during its construction and especially in *Engineering News* for June 19, 1913, and *Engineering Record* for Nov. 1, 1913, where are published semipopular accounts of the aqueduct.

Consult: Frontinus, *De Aquæductibus* (Eng. trans. by Herschel, 2d ed., New York, 1913); Friedländer, *Darstellungen aus der Sittengeschichte Roms* (Leipzig, 1888-90); Leger, *Les travaux publics des Romains* (Paris, 1875); Wegmann, *The Water Supply of the City of New York* (New York, 1896); White, *The Catskill Water Supply of New York City* (ib., 1913).

AQUEOUS HUMOR. A limpid fluid which occupies the anterior chamber of the eyeball, the space between the cornea and the lens. In foetal life the chambers are divided by the membrana pupillaris (q.v.) and in adult life by the iris. It consists of water, with, according to Berzelius, about a fiftieth of its weight made up of chloride of sodium and extractive matters held in solution. This watery secretion is produced by epithelial cells covering the posterior surface of the iris and the ciliary muscle. (See EYE.) It is rapidly resecreted if allowed to escape through a wound in the cornea.

AQUEOUS ROCKS. In geology, rocks which have been laid down as mechanical, chemical, or organic deposits from water. They belong to the stratified rocks, which also include rocks deposited from air (æolian deposits).

I. The mechanical deposits from water are derived from the destruction of preëxisting rocks. Rain and rivers move considerable quantities of disintegrated material, depositing it wherever the load is too great for the volume

and velocity of the current. Waves, rolling against a shore, break from it small and large fragments, carry these fragments back with them, and deposit them in layers on the bottom of the basin. The coarse particles are left nearest the shore, forming conglomerate or gravel; finer particles are carried somewhat farther out, forming sand, which by cementation becomes sandstone, quartzite, novaculite, or, when mixed with feldspar, arkose or graywacke; still finer particles are carried yet farther out and are deposited, to form mud or clay, which by cementation or consolidation becomes mudstone, shale, or slate.

II. Chemical deposition from water may be due to the mingling of solutions, to changes in the temperature or pressure of water containing substances in solution, or to the simple evaporation of water. For convenience in discussion, chemical precipitates may be divided into three general classes: (a) precipitates of the alkalis and alkaline earths, giving calcareous tufa, sinter, travertine, stalactite, onyx marbles, oolite, gypsum, rock salt; (b) siliceous precipitates, giving chert (flint or hornstone), geyselite, siliceous sinter; (c) ferruginous precipitates, giving iron ores. Their deposition is frequently promoted by minute forms of vegetable and animal life that live in the water. So that some examples are closely related to class iii of the group.

III. Organic deposits originate in the growth and decay of organisms, either *in situ* or after transportation. Deposits of this character are commonly made in water which is deeper and quieter than that in which chemical deposits are made. They may be divided into (a) calcareous accumulations, resulting in shell marl, chalk, limestone, dolomite; (b) siliceous accumulations, such as infusorial earth, siliceous ooze, some forms of flint or chert; (c) ferruginous accumulations resulting in certain bog ores; (d) carbonaceous accumulations, known as peat, lignite, brown coal, or coal.

Rocks of mechanical and organic deposition form the great mass of the aqueous rocks. The common order of occurrence from the shore outward—conglomerate, sandstone, mud, and limestone—corresponds in a general way with increase in depth of water. It follows, therefore, that if at any point the body of water is transgressing on the land, resulting in deepening of the water, the vertical order of superposition of mechanical deposits will be conglomerate, sandstone, shale, and limestone; and, vice versa, if the water is receding, the order will be reversed. There is thus a change of character of the sediments in any series both laterally and vertically. See GEOLOGY; LITHOGENESIS.

AQUILA (Lat. *aquila*, an eagle). A constellation lying on the celestial equator. Its brightest star, Altair, is of the first magnitude, and has a parallax (q.v.) of 0".23. A *nova* or temporary new star was discovered in this constellation by Mrs. Fleming on negatives taken at Harvard in 1899.

AQUILA. A companion of Paul mentioned in Acts xviii. 2 f., 18, 26; Rom. xvi. 3 f., 1 Cor. xvi. 19, and 2 Tim. iv. 19. He is said to have been "of Pontus by race," but a Jew, probably a proselyte. Expelled from Rome, when the Jews were driven out of the city after the insurrection of Chrestus (see Suetonius, *Vita Claudii*, 15) c.49 A.D., he went to Corinth, where he probably was converted to Christianity by

Paul. Like him, he was a tent-maker by trade. His wife, Prisca (q.v.), or Priscilla, is often mentioned before him, always together with him, and seems to have been a strong personality. The couple moved over to Ephesus, where they saved the life of Paul at the risk of their own necks. When Apollos (q.v.) came to Ephesus, they undertook to "expound unto him the way of God more perfectly" (Acts xviii. 26). From Rom. xvi. 3 f., it has been inferred that they afterwards returned to Rome, but many scholars regard these salutations as later additions, possibly from another epistle. The author of 2 Timothy still places them in Ephesus. Later tradition connects Aquila with Luke as his life-long companion and makes him one of the 70 disciples sent out by Jesus (Luke x. 1). See the commentaries on Acts, the Lives of Paul, and Lipsius, *Apokryphe Apostelgeschichten*, vol. i, pp. 203, 399; vol. ii, pp. 2, 367 (1883-90).

AQUILA, ä'kwê-lâ, DEGLI ABRUZZI (It. Aquila of the Abruzzi). An episcopal city in south Italy, on the Terni-Solmona Railway, 62 miles southeast of Terni (Map: Italy, H 5). It is pleasantly situated on a hill beside the Aterno, and because of its altitude (2200 ft.) it is a favorite summer resort. The streets are broad, the houses picturesque, and the churches numerous and interesting. In 1703 it was almost destroyed by an earthquake, in which 2000 persons perished. The historical vicissitudes of the city are interesting. Frederick II built it in the thirteenth century to check papal depredations. Soon afterward Manfred razed the city, following which it was rebuilt by Charles I, and the free peasantry of the district maintained it as an almost independent republic until the Spaniards compelled its subjection in 1529. It has linen, leather, paper, and wool factories, and is an important saffron and lace market. Pop., 1881, 14,720; 1901, 21,261; 1911, 21,724.

AQUILA, GREEK VERSION OF. See **AQUILA**, PONTICUS.

AQUILA, ä'kwê-lâ, JOHANN KASPER (1488-1560). A German Protestant reformer. He was born in Augsburg, studied at Ulm and in Italy, and in 1515 was appointed chaplain to Franz von Sickingen. He accepted Lutheranism and was imprisoned, but was released, and while court chaplain to the Elector of Saxony at Wittenberg (1524-27), through his knowledge of Hebrew assisted Luther in translating the Bible. Against the Interim (q.v.) he wrote *Christliche Bedenken auf das Interim* (1548) and *Das Interim illuminiert* (1548), for which a price was set on his head by Charles V. In 1552 he was restored to his pastorate at Saalfeld, which Luther had procured for him in 1527, and filled that office until his death.

AQUILA, PONTICUS, i.e., **AQUILA OF PONTUS**. A celebrated translator of the Old Testament into Greek. He was born at Sinope in Pontus, Asia Minor, and is said by Epiphanius to have been a relative of Emperor Hadrian, who in the twelfth year of his reign, i.e., 128 A.D., sent him to rebuild Jerusalem as Ælia Capitolina. He became a Jewish proselyte and a disciple of Rabbi Akiba, under whose guidance he made his translation before 135 A.D. His version was marked by an extreme literalness and was preferred by the Jews to the so-called Septuagint. Justin seems to have known it in 160 A.D., and Irenæus refers to it in 177 A.D. Origen copied it in the third column of his Hexapla and used

it, with Theodotion's, in his recension of the Septuagint. The scattered quotations in the Church fathers and the margins of manuscripts have been best published by Field, *Origenis Hexaplorum quæ supersunt* (Oxford, 1875). Specimens have been recently discovered in Cairo and published by F. S. Burkitt, *Fragments of the Book of Kings, according to the Translation of Aquila* (Cambridge, 1897), and C. Taylor, *Origen's Hexapla* (part of Ps. xxii) (Cambridge, 1901).

AQ'UILA'RIA. See **ALOES WOOD**.

AQ'UILE'GIA. See **RANUNCULACEÆ**.

AQUILEIA. See **AQUILEJA**.

AQUILEJA, ä'kwê-lâ'yâ (or **AGLAR**, ä-glâr', as it was called in the Middle Ages). A small town of the Austrian crown-land of Görz and Gradisca, situated on the Lagunadi Grado, which is at the head of the Adriatic, about 25 miles west-northwest of Trieste (Map: Austria, C 4). This once flourishing seaport has dwindled to an insignificant fishing place of a few thousand inhabitants, with little to remind one of its former prosperity and importance but its ancient cathedral and the remains of the Patriarch's Palace. It offers, however, a rich field to antiquarians. Strongly colonized by the Romans in 183 B.C. as a bulwark against the Celts, it became in time the second city of Italy, and in 168 A.D. was so strongly fortified by Marcus Aurelius as to be considered the most important post of the Empire on the north. In the reign of Hadrian, its population was between 300,000 and 500,000. It was the meeting place of the Æmilian Way (q.v.) and the roads and Alpine passes leading to central and southeastern Europe, and one of the principal naval ports; it was thus an important centre of trade. The surrounding country supplied wine, oil, cattle, and hides. Here the Emperor Maximinus perished (238), and in the vicinity Constantine II lost his life in a battle against his brother Constans (340). When the town was destroyed by Attila (452), it had 100,000 inhabitants. It never recovered, although between 556 and 1750 it was the seat of a patriarch. In 1809 it was acquired by Austria. Consult: G. Bartoli, *Le Antichite d'Aquileja* (Venice, 1739); Zahn, *Austria Friulana* (Vienna, 1877); Meyer, *Die Spaltung des Patriarchats Aquileja* (Berlin, 1898).

AQUIN, ä'kän'. A seaport on the south shore of the island of Haiti, 50 miles west of Jacmel, and a few miles east of Aux Cayes. It exports dyewood. The population numbers about 22,000.

AQUINAS, THOMAS, or THOMAS OF AQUINO (c.1226-74). One of the most influential of the scholastic theologians, who bears the honorable titles and epithets of *Doctor Communis* ('Universal Doctor,' fourteenth century); *Doctor Angelicus* ('Angelical Doctor,' sixteenth century); *Princeps Scholasticorum* ('Prince of Scholastics'); *Doctor Ecclesiæ* ('Doctor of the Church,' 1567); "Patron of all Catholic Schools" (1880). He was of the family of the counts of Aquino, in the kingdom of Naples, and was born in the castle of Roccasecca, directly north of Aquino, about 50 miles northwest of Naples, about 1226. He received the rudiments of his education from the Benedictine monks at Monte Cassino, which was only a few miles away, and completed his studies at the University of Naples. A strong inclination to philosophical speculation and theological study determined the young nobleman, against the will of his family, to enter (1243) the Order of Dominicans. In order to frustrate

the attempts of his friends, especially his mother, to force him to give up his monastic life and enter the world, his order sent him to Rome and thence to Paris. On his way thither his brothers overtook him at Acquapendente, and by force brought him to the castle of St. John, near Aquino, and there he was closely guarded for a year, and every effort was made to break his resolution to remain a monk. But at length his mother came to his release, and he went, in the company of the General of the Dominicans, to Paris and thence to Cologne, about 1245, where he studied under Albert the Great (Albertus Magnus) (q.v.). At Cologne he pursued his studies in such silence that his companions gave him the name of the "Dumb Ox." But Albert is reported to have predicted "that this ox would one day fill the world with his bellowing." He accompanied Albert to Paris in 1245 and back to Cologne in 1248, when he was commissioned by his order, the Dominican, to establish a theological school there. In it Aquinas taught until in 1251 (or 1252) he was sent to Paris to teach in the Dominican monastery of St. Jacques. He defended his order in his *Contra Impugnantes Dei Cultum et Religionem*. He was already a distinguished scholar and teacher. He continued to lecture with great applause in Paris, till Urban IV, in 1261, called him to Italy to teach philosophy in Rome, Bologna, Pisa, and other places. Finally he came to reside in the convent at Naples (1272-74), where he declined the offer of the dignity of archbishop, in order to devote himself entirely to study and lecturing. It was while there that the following incident is said to have occurred. One day Christ appeared to him and said: "You have written ably about me. What reward would you like to have?" He said: "Lord, nothing, except thyself." Being summoned by Gregory X to attend the general council at Lyons, he was taken ill on the way in the castle of his niece at Ceccano. Realizing that it was his last illness, he was at his own request transferred to the neighboring Cistercian monastery of Fossanuova, so that he might die in a religious house. He lingered there a month and died on March 7, 1274. Dante held (*Purgatorio*, xx, 68) that he was poisoned at the instigation of Charles I of Sicily, who dreaded the evidence that Aquinas would give of him at Lyons; but it is probably not true. His relics were fought for, and his right arm is now in St. Jacques, Paris, other parts in Salerno and Naples, and the rest of his body in Rome. He was canonized July 18, 1323.

Even during his life Aquinas enjoyed the highest consideration in the Church. His voice carried decisive weight with it. A general chapter of Dominicans in Paris made it obligatory on the members of the order, under pain of punishment, to defend his doctrines. Like most of the other scholastic theologians, he had no knowledge of Greek or Hebrew and was almost equally ignorant of history; but his writings display a great expenditure of diligence and dialectic art, set off with the irresistible eloquence of zeal. His chief works are: *A Commentary on the Four Books of Sentences of Peter Lombard*, the *Summa Theologiae*, *Questiones Disputatae et Quodlibetales*, and *Opuscula Theologica*. He gave a new and systematic foundation to the doctrine of the Church's treasury of works of supererogation, to that of withholding the cup from the laity in the communion, and to that of transubstantiation. He also treated Christian morals

according to an arrangement of his own, and with a comprehensiveness that procured him the title of the "Father of Moral Philosophy." The definiteness, clearness, and completeness of his method of handling the theology of the Church gave his works a superiority over the text-books of the earlier writers on systematic theology. His *Summa Theologiae* is the first attempt at a complete theological system, but he died ere he could complete it. In his philosophical writings, the ablest of which is his *Summa de Veritate Catholicae Fidei contra Gentiles*, he throws new light upon the most abstract truths. The circumstance of Aquinas being a Dominican, and boasted of by his order as their great ornament, excited the jealousy of the Franciscans against him. In the beginning of the fourteenth century Duns Scotus (q.v.), a Franciscan, came forward as the declared opponent of the doctrines of Aquinas, and founded the philosophico-theological school of the Scotists, to whom the *Thomists*, mostly Dominicans, stood opposed. The Thomists leaned in philosophy to nominalism (q.v.), although they held the abstract form to be the essence of things; they followed the doctrines of Augustine as to grace, and disputed the doctrine of the immaculate conception of the Virgin. The Scotists, again, inclined to realism and to views of the Semipelagians and upheld the immaculate conception.

Aquinas's life was spent in such great toil, not only as an author but as a teacher and as the trusted servant of his order and the adviser of popes, that it was comparatively brief. Yet its literary product was enormous. His mind was remarkably clear, so that although he was the very embodiment of the scholastic method of endless analysis and questionings, he wrote in a way intelligible and interesting to the modern reader. One of his great services is the prominence he gives to Aristotle, upon whose works he wrote elaborate commentaries. Plato also was his master, and to the fathers he yielded loyal submission. He also was a profound Bible student, as he showed in his *Catena Aurea*, which is an exhaustive theological interpretation of the Gospels. In fact, take him all in all, there is no theologian of the past who deserves and rewards study more than he, and the Roman Church does well in accepting him as her great master in theology. Pope Leo XIII in his Encyclical, "Æterni patris" (Aug. 4, 1879), declared that the philosophy and theology of Aquinas was the proper basis for all such teaching in Catholic Christendom.

His works, all written in Latin, were first printed by Pope Pius V (Rome, 1570-71, 17 vols., folio; mod. ed., Paris, 1871-80, 34 vols., 8vo; probably final form, sanctioned by Pope Leo XIII, Rome, 1882). The greatest of the works, the *Summa Theologiae*, was reprinted in 8 volumes (Paris, 1869); German translation, 12 volumes (Ratisbon, 1886-92). The *Summa de Veritate Catholicae Fidei* has been published in French, with Latin text (Paris, 1854). Modern English translations of parts of all the works have been published as follows: *Catena Aurea* (8 vols., London, 1841-45); *On the Rulers and Members of Christian States*, from *De Regimine Principum* (London, 1860); *Homilies upon the Epistles and Gospels for the Sundays of the Christian Year*, and the *Festival Homilies* (London, 1873); *On the Two Commandments of Charity and the Ten Commandments of the Law* (London, 1880); *Notes on the Angels* (London,

1888); *Maxims and Prayers and the Little Office* (London, 1890); *On the Sacrament* (London, 1890); *Aquinas Ethicus, or the Moral Teachings of St. Thomas* (London, 1892); *The Lord's Prayer*, made up of parts of the *Summa*, in condensed translation (London, 1892). For interpretation of his work in general, consult L. Schütz, *Lexicon. Sammlung, Uebersetzung und Erklärung der in sämmtlichen Werken des heiligen Thomas von Aquinas vorkommenden Kunstausdrücke und wissenschaftlichen Aussprüche* (Paderborn, 1895). For his biography, consult: in English, R. B. Vaughan (London, 1893), Pius Cavanagh (1890); in German, C. Werner (Regensburg, 1858-59), J. Tansen (Kevelaer, 1898); in Dutch, H. J. Schaepman (Utrecht, 1898).

AQUINO, ä-kwē'nō. A town in the province of Caserta, Italy, 5 miles northeast of Pontecorvo. It is the seat of a bishop, and, in addition to the Via Latina, which is near by, there are ruins of the Roman town, Aquinum. The most interesting of these are fragments of the temples of Diana and Ceres, a gateway now known as the Porta San Lorenzo, and a theatre. In 1224 the philosopher Thomas Aquinas was born in the neighboring castle of Roccasecca. Aquino is also celebrated as the birthplace of Juvenal. Pop., 1911, 3222.

AQUITA'NIA. The Latin name of a part of Gaul, originally including the country between the Pyrenees and the Garonne, peopled by Iberian tribes. Augustus, when he divided Gaul into four provinces, added to Aquitania the country lying between the rivers Garonne and Loire. Shortly before the extinction of the Roman Empire, Aquitania passed into the hands of the West Goths. In 507 it was conquered by Clovis, King of the Franks, and during the Merovingian dynasty became an independent duchy. Though subjugated by Charlemagne, the duchy again claimed independence under the weak monarchs of the Carolingian dynasty. In 1137 Aquitania (or Aquitaine, a name later supplanted by the name *Guienne*) was united to the crown of France by the marriage of Louis VII with Eleanor, heiress of Aquitania. In 1154 it was united with England, as the result of the marriage (1152) of Henry Plantagenet with Eleanor, whom Louis had divorced, and a long series of disputes took place between England and France respecting Aquitania, which was ultimately united to the crown of France by Charles VII in 1451.

ARA, ä'rä, or **ARARA**. See **COCKATOO**.

ARABAH, ä'rä-bä. The name used in ancient times to designate the entire length of the deep depression extending through the Jordan valley and the Dead Sea as far as the Gulf of Akabah. It was consequently applied to the district around the Lake of Galilee (Deut. iii. 17); the Dead Sea was called the "Sea of the Arabah" (Deut. iv. 49), and the "Brook of the Arabah" (Amos vi. 14) was probably the Wadi el Ahsa falling into the Dead Sea from the south. At present the term is confined to the southern part between the Dead Sea and the Gulf of Akabah, while the northern part including the Jordan valley and the Dead Sea is called El ghor, 'the depression.' Consult Hull in *Memoirs of the Palestine Exploration Fund* (1886); Lartet, *Voyage d'Exploration de la Mer Morte* (1880); Blankenhorn, in *Zeitschrift des deutschen Palästina-Vereins* (1896); Musil, *Petræa: Edom* (1907-08).

AR'ABA'TA (native South American name). The straw-colored howling monkey. See **HOWLER**.

ARABESQUE, är'ä-bësk' (Fr.). The term signified originally 'resembling Arabic work' and was properly applied to ornament which, by its intricate and fantastic character and avoidance of naturalistic representation, might be held to suggest Arabic decoration. (See **ARABIAN ART** and **MOHAMMEDAN ART**.) Its use came, however, to be extended so as to apply to any intricate decoration of a conventional or fanciful character, such as the foliated scroll patterns of late Greek, Roman, or Pompeiian friezes, panels, and pilasters, and even to the complex interlaced designs of Byzantine, Irish, Scandinavian, and Romanesque art of the early Middle Ages, in which grotesque symbolic monsters were intertwined with vines and scrolls. When the Renaissance sought to revive the arts of classical antiquity, the Roman ornamentation was imitated more or less freely, and the term "ara-



a



b

ARABESQUE.

a, Arabian Arabesque. b, Italian Arabesque.

besque" applied to much of the resulting decoration, although this in no wise resembles Arabic design. The most celebrated designer of such arabesques was Raphael, who made a special study of the painted stuccoes of the Baths of Titus, the Golden House of Nero, and the ruins on the Palatine, and produced in the famous arabesques of the Loggia of the Vatican, designs of marvelous fertility of invention, which powerfully influenced the decorative art of the sixteenth century. In common usage to-day any conventional pattern of an intricate character, composed of graceful interlaced curves and more or less fantastic forms, is called an arabesque.

ARABESQUE. In music, the ornamentation of a theme by means of grace notes, trills, arpeggios, etc. Since Schumann used the term as a title for one of his piano pieces (op. 18), an extremely graceful composition in free rondo form, several other composers have given the same title to works similar in character and form. Among the finest examples are the two exquisite arabesques in E and G by Debussy.

ARABGIR, ä'räb-gër'. See **ARABKIR**.

ARABIA. The great southwestern peninsula of Asia, called by the inhabitants *Jazirat al 'Arab*, 'the peninsula of Arabia'; by the Turks and Persians, Arabistan. Its northern boundary depends upon whether Arabia Petræa and the Syrian Desert are included or not, and is consequently drawn either from Akaba to Koweit, from Port Said due east to Akaba and Koweit, from Port Said to the southern end of the Dead Sea and then across to the head of the Persian Gulf, or from the Egyptian border to Akaba or al Ahsa and then in a semicircle around the Hammad to the Persian Gulf. On the east it is bounded by the Persian Gulf and the Gulf of Oman; on the south by the Indian Ocean and the Gulf of Aden, and on the west by the Red Sea and, if the Sinaitic peninsula is included, the Isthmus of Suez. When the name is taken in its widest sense, Arabia may be said to be situated in lat. $12^{\circ} 40'$ to about 35° N., and long. $32^{\circ} 30'$ to 60° E., its greatest length from north to south being about 1500 miles, its greatest breadth about 1200 miles, and its area about 1,200,000 square miles; without Arabia Petræa and the Syrian Desert, it would reach to lat. $29^{\circ} 30'$ N., begin with long. 35° E., and have an area of about 1,000,000 square miles.

The name "Arabia" is probably derived from 'Arab, 'desert,' of which the feminine form is still used to designate the arid depression between the Dead Sea and the Ælanitic Gulf. (See ABABAH.) 'Arab was the name given by the Hebrews to the desert, to a particular people in the desert, and to the steppe-dwellers of north Arabia in general (Isa. xxi. 13; Ezek. xxvii. 21; Jer. xxv. 24). Already Shalmaneser III characterized Gindibu, who came with 1000 camels to the battle of Qarqar (854 B.C.) as an Arabian (*Ar-ba-a-a*), and after his time *Arabu*, *Arabia*, or *Aribi* occurs frequently in the Assyrian inscriptions. It is not impossible that the Eremitæ ('Ερεμιταί) in Homer are Arabians (*Odyssey*, iv, 84), as Zeno and Strabo maintained, but it cannot be regarded as certain. Darius I (521-485 B.C.) mentions *Arabaya* among the subject lands, always placing it after Babylonia and Assyria, but before Egypt (*Behistun Inscription*, i, 15). In Sabæan inscriptions 'Arab is used apparently as a designation of the nomads in north Arabia (*Corpus Inscriptionum Semiticarum*, iv, p. 123). In his article on 'Arabia' in *Encyclopædia Biblica*, Nöldeke has pointed out that one of the oldest poets employs the term 'arraba for 'speaking plainly,' i.e., 'speaking in Arabic.' Gradually the name extended from the nomad to the settled people in north Arabia, from north Arabia to the whole peninsula.

Ptolemy divided the country into *Arabia Petræa*, *Arabia Felix*, and *Arabia Deserta*. By *Arabia Petræa* he understood the Roman province of Arabia, including the territory east of the Araba taken by the Nabatæans, the later Idumæa or the Negeb (q.v.), and the Sinaitic peninsula; by *Arabia Felix* he meant the independent country west and south of the desert, from Akaba to Bab-el-Mandeb and Oman, and by *Arabia Deserta*, probably the Hammad and Nufud standing more or less under Parthian influence. The name "Arabia Petræa" was derived from Petra, the capital of the ancient Nabatæan kingdom and of the Roman province. As Petra means 'rock,' Arabia Petræa was in later times wrongly interpreted as Stony Arabia. *Arabia Felix*, like the Greek 'Αραβία εὐδαιμών (*Arabia Eudaimon*), was an essentially correct trans-

lation of 'Arab al yaman, which meant the Arabia that is on the right hand, i.e., on the south, and also on the lucky side. In Ptolemy's time the region south of Akaba (q.v.) was evidently called by the Arabs *al Yaman*, 'The South,' in distinction from the region north of this point called *al Sham*, 'The North.' The Dahna desert, south of Nejd, is not likely to have been known to Ptolemy. The Arab geographers of the Middle Ages give us the names of various provinces, and these have for the most part continued in use to the present time. The present provinces are (1) *al Tih*, the Sinaitic peninsula; (2) *Hejaz*, or the 'barrier,' a name originally referring to its position between Tihama, the coastland, and Nejd, the highland, but later assumed to refer to its location between al Sham (Syria) and al Yaman (Yemen); (3) *Asir*, the alpland south of Hejaz, known under this name only during the last century, formerly belonging in part to Hejaz and in part to Yemen; (4) *Yemen*, the southwestern corner of the peninsula, having, like Hejaz and Asir, its Tihama, or littoral, on the Red Sea and including Nejran; (5) *Hadramaut*, east of Yemen, along the southern coast; (6) *Mahra* and *Shihr*, the ancient *Habashat*, the incense country farther east to the border of Oman (7) *Oman*, the southeast projection into the Indian Ocean; (8) *Hasa*, formerly called *Hajar* and *Bahrain* (the two seas, referring to the Persian Gulf on both sides of al Katar); (9) *Bahrain*, now used as a designation of Uwal and seven other islands in the Persian Gulf opposite Hasa; (10) *Dahna*, the great territory between Hadramaut, Oman, and Nejd; (11) *Nejd*, in the interior; and (12) *Nufud*, the desert north of Jebel Shammar. The Hammad is divided into three parts, *Badiyah al Sham*, *Badiyah al Jazira*, and *Badiyah al Irak*, deserts of Syria, Mesopotamia, and Babylonia, respectively; while southern Belka and al Makra are now counted as belonging to Syria.

Our information concerning the physical geography of Arabia comes partly through such classical writers as Eratosthenes, Strabo, Pliny, and Ptolemy, and Arab geographers like Hamdani, Ibn Haukal, Istakhri, Mukaddasi, Idrisi, Ibn al Mujawir, and Ibn Batuta, and partly through modern explorers. Much of our knowledge is due to the accounts of north Hejaz, or the Land of Madyan, by Beke, Burton, Doughty, Huber, Euting, and, most recently, Jaussen and Savignac; of the holy cities by Varthema, Leiblich, Burckhardt, Burton, Hurgronje, and Maltzan; of Asir by Tamisier; of Yemen by Niebuhr, Forskål, Arnaud, Halévy, and Glaser; of Hadramaut by Wrede and Hirsch; of Oman by Wellsted, Palgrave, and Zwemer; of Hasa by Pelly; of Bahrain by Bent; of Nejd by Sadlier, Wallin, Doughty, Lady Anne Blunt, and Palgrave; and of various parts of Arabia Petræa by Seetzen, Burckhardt (the discoverer of Petra), Laborde, Brünnow and Domaszewski, Palmer, Trumbull, Lagrange, Schmidt, Musil, Stanley, Hull, Petrie, and others. Yet their visits were for the most part merely tours of reconnoissance. No part of the country has been properly surveyed, and more than one-third of it is absolutely a *terra incognita*. How far its character may have changed in historic times is impossible to determine. But De Goeje has expressed the conviction that the great wadies, Humth, Dawasir, Hanifa, Rumma, and others, were once perennial streams; and Caetani, *Studi di Storia Orientale*

(Milano, 1911), has given strong reasons for the belief that the desiccation has taken place in the last few thousand years, and that in earlier times the huge peninsula had physical features and climatic conditions far different from those now prevailing and more conducive to the development of human life. The largest portion of the country lies in that great desert zone which stretches from the shores of the Atlantic to those of the northern Pacific. The interior, so far as it has yet been explored, seems to be a great plateau, in some places reaching a height of 8000 feet. The western border crest of this plateau may be regarded as part of a mountain chain, beginning in the north with Lebanon and stretching south to the Strait of Bab-el-Mandeb. From Bab-el-Mandeb another chain runs northeast, parallel to the coast, to Oman. The elevation of the mountains in the extreme south of the peninsula is estimated at 13,000 feet. From the mountain range on the west the plateau slopes to the northeast and forms in general a vast tract of shifting sands, interspersed here and there about the centre with various ranges of hills, which, like the shores of the peninsula, are generally barren and uninteresting.

One of the chief characteristics in the physical aspect of the country is the scarcity of permanent rivers. Like most desert regions, Arabia has a large number of river courses, or *wadies*, among which the Wadi al-Rumma is the longest, traversing under different names the entire country from west to east. But they are, almost without an exception, either completely dried up or only filled with water now and then in the rainy season. Springs are very few, and in the cultivated parts of the country large numbers of wells, cisterns, and reservoirs are prepared for the reception of rain water.

Arabia has, on the whole, an African climate. Though surrounded on three sides by the sea, its chains of hills exclude in a great measure the modifying influence of air currents from the ocean. In several parts of Arabia hardly a refreshing shower falls in the course of the year, and vegetation is almost unknown; in other torrid districts the date palm is almost the only sign of vegetable life. Over vast sterile tracts hangs a sky of almost perpetual serenity. The time and duration of the rainy season varies in the different parts of the country. In Yemen it lasts from June to September and is often followed by a shorter rainy season in the spring. In the coast regions of Hadramaut and Oman it lasts from February to April, while in the highlands of the former it takes place between April and September. Light frosts mark the winters in the centre and northeast. During the hot season the simoom (q.v.) blows, but only in the northern part of the land.

The districts which are not too arid for culture produce wheat, barley, millet, dates, tobacco, indigo, cotton, sugar, tamarinds, coffee, balsam, aloe, myrrh, frankincense, etc. Arabia has but a small area of forests, but has vast stretches of desert grass, fragrant with aromatic herbs, and furnishing admirable pasturage for the splendid breed of horses. Coffee, one of the most important exports, is an indigenous product of both Arabia and Africa, as are also the date palm and banana. The trade in coffee, dates, figs, spices, and drugs was once very important, but is now much smaller than formerly. Arabia has few manufactures, but carries on a transit

trade in foreign fabrics, besides importing these to some extent for its own needs.

In the animal kingdom an African character prevails generally. Sheep, goats, and oxen satisfy the immediate domestic and personal necessities of the inhabitants, to whom the camel and horse are trusty companions in their far wanderings. Gazelles and ostriches frequent the oases of the deserts, where the lion, panther, hyena, and jackal hunt their prey. Monkeys, pheasants, and doves are found in the fertile districts, where flights of locusts often make sad devastation. Lizards and venomous snakes are numerous. Fish and turtle abound on the coast. The noble breed of Arabian horses has been cultivated for several thousand years, but the horse is of less general importance in Arabia than is popularly supposed. The most characteristic of all animals in the peninsula is the camel; the breed of Oman is celebrated for its beauty and swiftness. Among the minerals of Arabia may be mentioned iron, copper, lead, coal, basalt, and asphaltum, and the precious stones emerald, carnelian, agate, and onyx. Pearls are found in the Persian Gulf.

According to Palgrave's estimate, Hejaz has about 1,000,000 inhabitants; Yemen, 1,000,000; Hadramaut and Mahra, 1,000,000; Oman and Hasa, 2,500,000; and Nejd, 2,000,000, which would give to Arabia a population of about 7,500,000. These figures are probably too high; but with our total ignorance concerning the larger part of the interior, and in the absence of a regular census for any district, it is not possible to verify any statement on this point. The Arab is of medium stature, compactly built, and of brown complexion. Earnestness and pride are distinctive characteristics; by nature he is quick, sharp-witted, lively, and passionately fond of poetry. Courage, temperance, hospitality, and good faith are his leading virtues; but these are often marred by a spirit of sanguinary revenge and rapacity. His wife keeps the house and brings up the children. Even in the desert the children are generally taught to read, write, and calculate. The Arab cannot conceive a higher felicity than the birth of a camel or a foal, or that his verses should be honored with the applause of his tribe. The Arabs are, as a rule, monogamists, although frequently the wealthy chiefs have several wives. Matrimonial ties are severed at will, and the ill-treated wife can always find refuge in her father's tent.

Arabian life is either *nomadic* or *settled*. The wandering tribes, or Bedouins, are well known to entertain very loose notions of the rights of property. The settled tribes, styled Fellahs, are despised by the Bedouin, who scorns to be tied down to the soil, even where such bondage might make him wealthy.

Ethnography. Concerning the earliest inhabitants of the peninsula we have no definite knowledge. Doughty found in the northern deserts stone implements of a well-known type furnishing evidence of man's existence there in the Paleolithic Age. Whether the race that produced them was swept away or merged with tribes coming from the west, we have no means of determining. On the whole, the latter theory seems preferable to the assumption that the Semites were the descendants of the Stone Age people first occupying the country. The Semitic type may have developed in Africa before the invasion of Arabia, or it may be the result of a fusion of the invaders with the aborigines, as

in Babylonia, Syria, and Abyssinia. The stock that already was, or was destined gradually to become, Semites may have shown, at its first appearance in Arabia, the power to absorb and to assimilate which has been a characteristic trait ever since. The tribes that emigrated from Arabia and became known in history as Akkadians, Assyrians, Lulubians, Gutians, Amorites, Aramæans, Hebrews, and Chaldæans brought with them Semitic speech, though they spoke different Semitic languages. When these migrations took place, the population had not yet attained the degree of homogeneity found in later times. Before the leveling influence of Islam came in, there were always marked differences between the settled tribes of the south and the nomads of the north, those on the Erythraean and those on the Persian Gulf and the Indian Ocean. Islam united Arabia, but also sent out its sons to all parts of the Moslem world and drew to it slaves and foreigners who had accepted this faith. This must be borne in mind when the present Arab type is considered. It presents examples of the tall and the short, the long-headed and the broad-headed, the brunette and the blond, the straight-haired and the wavy-haired, evidencing considerable intermixture with Negroid and Aryan elements. Differences continued to exist between the Kalb, or southerners, and the Kais, or northerners, between the city-dwellers and the nomads; but the unity of language and religion made it possible for the Arab to make a strong impression upon the world outside of his peninsula. He took a leading part, together with the Persian, in developing Moslem civilization. The Arabic alphabet spread with the Arabic religion; the Arabic numerals were indeed derived from India, but in the hands of the Arabs became an instrument for a higher development of mathematics. The Arabs fostered commerce and geographical exploration, created a new order of architecture, made the productions of the Greeks accessible to European nations, and in the cultivation of the sciences, philosophy, literature, and art were far in advance of the rest of the world. Even away from Arabia they have maintained their peculiar genius, and when they intermarried with conquered or converted peoples, have to a remarkable extent impressed upon them their own characteristics. Hamites, Negroes, Aryans, Mongolians, and Malays have received a large infusion of Arab blood; and Keane rightly emphasized the absorptive power of the Arabs, to whom not only the mass of kindred Semites in Asiatic Turkey, but also other ethnic elements embracing Islam have the tendency of becoming more and more assimilated. See Plate, RACES OF ASIA, accompanying ASIA, and the articles on SEMITES. For various topics connected with the ethnography of Arabia consult *The Encyclopedia of Islam, A-D* (Leyden, 1908-13).

Politically, Arabia is divided as follows: The Sinaitic peninsula forms a dependency of Egypt. The western coast, forming the two vilayets of Hejaz and Yemen, as well as the region of Hasa, on the eastern coast, belong to Turkey. Oman is administered by an independent imam, while Aden (q.v.) forms a dependency of Great Britain, which exercises a protectorate over a considerable territory. The remainder of the country is divided into a number of independent or semi-independent states, under hereditary or chosen chiefs, bearing the title of emir, sheikh, or imam. Their function appears to be limited

to leading the troops in time of war, levying tribute, and administering justice. A spirit of liberty in the people moderates the authority of their chieftains; but instances of extreme despotism have not been infrequent, in both early and modern times. The most important cities of Arabia are Mecca, Medina, and Jidda in Hejaz; Hodcida, Sana, Mocha, and Aden in Yemen; Makalla in Hadramaut; Maskat in Oman; Katif in Hasa; Riad and Hail in Nejd.

History. While historic data do not carry us beyond the last centuries of the second millennium B.C., the expeditions of Naram Sin, of Agade to Magan (East Arabia) and Gudea, of Lagash to Magan and Meluhha (West Arabia), as well as those of the Egyptian kings of the third and fourth dynasties, to the Sinaitic peninsula, may have taken place in the fourth millennium, and show that the country was then inhabited. The invasion of Babylonia by the Semitic Akkadians (see ACCAD), probably in the fifth millennium B.C., and those of Assyrians, Gutians, Lulubians, Amorites, Aramæans, Hebrews, and Chaldæans (q.v.) at various times after them, testify to the movements of peoples upon the peninsula and, to some extent, to their character, before the appearance of our first South Arabian inscriptions. The history of the last 3000 years may be divided into two great periods—one extending from the establishment of the Minæan kingdom to Mohammed, and the other from Mohammed to the present day. Each of these naturally falls into a number of sub-periods. In the first there are those of (1) the kings of Ma'in c.1200-750; (2) the *mukarribs*, or priest-kings, of Saba (c.750-525); (3) the kings of Saba (c.525-115); (4) the kings of Saba and Raidan (c.115 B.C.-300 A.D.); (5) the Aksumite invasions and the kings of Himyar (300-570). Although some eminent scholars still hesitate to bring the Minæan inscriptions back further than to the ninth century (see MINÆANS and SABÆANS), there is a growing tendency to concede that they are earlier than the Sabæan. The failure of any mention of the powerful Minæan kingdom, which had its outposts in northern Hejaz and al Tih, in the inscriptions of Assyrian kings who invaded that very region, while mention is made of the Sabæans, is significant, as is also the fact that the Minæans (Mainim) are referred to as invaders of Palestine in the days before Saul in Judges x. 12. The list of about 30 kings in Ma'in certainly covers a number of centuries. Nothing that is known to us concerning the origin of the alphabet prevents the assumption that the peculiar characters used in the Minæan inscriptions were already invented in the twelfth century B.C. (See ALPHABET.) It is not impossible that, in a period of comparative weakness on the part of the rulers in Ma'in, Saba was independent, and a Queen reigned in Marib, nor that this Queen of Sheba visited Solomon in Jerusalem, perhaps for political purposes, to enter into an alliance with the King, who had such vital interests at Ezion-geber on the Gulf of Akabah against their common enemy, the Minæan King, holding control of the land of Midian immediately south of this place. Similarly, the Sabæan mukarribs may have sought aid from Assyria. Tiglath Pileser IV (745-728), Sargon II (722-705), Sennacherib (705-681), Esarhaddon (681-668), and Asurbanipal (668-625) made expeditions into north Arabia and had dealings not only with the Sabæans

but also with the Kedarenes, the Dedanites, and the Nabataeans. In 715 a number of Hejaz tribes, among them the famous Tamudi, or Thamud, referred to by Mohammed, were deported to Samaria (q.v.). The conquest of Egypt by Cambyses in 525 paved the way for the subjugation of North Arabia, which was organized as a satrapy called Arabaya by Darius Hystaspis. It was no doubt the danger of the Persian approach that consolidated the Sabæan power in the south, and the rulers appear as kings after 525. Alexander was not able to carry out his plan to go into Arabia; and the Ptolemies who established trading stations on the Erythræan held peaceful relations with the tribes of Hejaz and Yemen. During the period of the kings of Saba and Raidan the most important event was the invasion of the country by the Romans. In the year 24 B.C. Augustus sent the prefect of Egypt, Ælius Gallus, with his ally, the Nabataean King Obodas II (28-9 B.C.), against the Sabæan power. The army of 10,000 men reached the territory of Saba, took the cities of Nejran, Nashk, and Kamina, but were unsuccessful in their siege of Marib and returned to Egypt. The Nabataean kingdom, which had extended into Hejaz, to Damascus, and toward the borders of Egypt, became a Roman province in 106, the year being fixed by an inscription of Rabel II dated in 405 of the Seleucid era and the twenty-fourth year of the King. The Palmyrene kingdom, flourishing especially under Odenath I, Odenath II, and Zenobia (q.v.), was overthrown by Aurelian in 272. Other buffer states, however, were established by the Lahmids of Hira, the Ghassanids of Bosra, and the Banu Kinda in Nejd. In the south the growing power of the Himyarites, leaning on the Sasanids, was only checked temporarily by the Aksumite occupation of Saba and Raidan (300-378 and 525-570), but practically ended by the Persian conquest in 570.

In the second period of Arabian history the centre of power shifts from Yemen to Hejaz. It may be divided into the following sub-periods: (1) Mohammed and the three first caliphs (570-656); (2) Ali and the Umayyads (656-750); (3) the Abbasids (750-900); (4) the Karmatians and the Fatimids (900-1171); (5) the Ayyubids (1171-1260); the Mamluks (1260-1517); and the Ottoman Turks, the Portuguese, the Wahabis, and other independent powers (1517-). Through the pressure of Christianity, represented by Abyssinia and the Byzantine Empire, and Mazdaism, represented by the zealous Sasanid dynasty, south Arabia lost its power and independence. But about the time when the end came, the man was born who was destined to weld together all Arabia by a new religious faith and a new political organization, to destroy the Persian Empire and all but annihilate the religion of Zoroaster, reduce Oriental Christianity to insignificant fragments, conquer northern Africa, Spain, and Sicily, and finally absorb the Byzantine Empire itself. He belonged to the tribe of the Kuraish. This tribe, living in and about Mecca, had risen to great prominence on account of its noble descent, its enterprise, and its wealth. Its members became the perpetual guardians of the sacred Kaaba at Mecca. This structure from the earliest times had been a place of pilgrimage for the peoples of the entire peninsula. In the great fairs which were annually held not far from Mecca, the first steps toward Arab unity were

made. These annual meetings were marked by the celebration of athletic games and poetic contests and possessed also a certain religious character which made them in some respects similar to the Olympian Games of ancient Greece, with which they may also be compared for their effect upon the building up of an Arabian nationality. The way, then, was prepared for Mohammed, who, through the teaching of Islam, was destined to unite the entire peninsula under his rule within the short period of 10 years; for after he had won over the powerful Kuraish to his doctrine and had provided himself in this manner with an efficient army, the chaotic condition of political life in Arabia made the spread of his faith all the more easy. Arabia enjoyed the most prosperous period of its history during the reigns of the first three caliphs (632-656), under whom Syria, Egypt, and Persia were conquered. Then the tide of Moslem conquest swept westward over the whole of northern Africa and the Spanish Peninsula and seemed about to engulf ancient Gaul, when it was arrested between Poitiers and Tours by Charles Martel, ruler of the Franks (732). The removal of the capital first to Kufa under Ali and then to Damascus under the Umayyads had tended to reduce the importance of Mecca and Medina, and with the spread of Islam the direct influence of Arabia itself gradually declined. This was especially true after the year 750, when the Umayyads were overthrown by the descendants of Abbas. So long as Damascus had been the centre of the Moslem world, the Arab element had been preëminent, and the great generals and administrators of the caliphs had been drawn chiefly from the inhabitants of the peninsula; but with the establishment of the Abbásid dynasty of caliphs, who removed the seat of the Mohammedan power in the east to Bagdad, and the rise of a great Mohammedan realm in the extreme west, the magnificent rôle which Arabia had played came to an end. The Abbasid caliphs continued indeed to be recognized, after the insurrection quelled by Hajjaj, in Hejaz; but independent amirates grew up in Yemen and Oman. The tenth century was characterized in Arabia by the spreading power of the Karmatians, a religious and political sect whose founder was Abdallah ibn Maimun, though it was named after Hamdan al Karmat. (See MOHAMMEDAN SECTS.) In 900 Hasa was conquered; in 929 Mecca was taken and the sacred stone carried away; in 951 Oman was subdued. The whole peninsula was ruled by the mahdi and caliph of this powerful sect. The Fatimids were able to some extent to restore order in Hejaz; but the growing power of the grand-sharif of Mecca soon made their authority merely nominal. By the services of Saladin in freeing Mecca and Medina from that awful scourge, the lord of Montreal (Shobek), Renaud de Chatillon, the Ayyubids gained much prestige and influence in Hejaz; and Mamluks like Nazir (1310-1345) retained some power in Hejaz and were prayed for as caliphs in Mecca, though every attempt to gain control of Yemen was a failure. The imamates, sultanates, and amirates of Hasa, Oman, Yemen, and Nejd were quite independent. In 1508 the Portuguese captured Maskat and held it until 1659, when it fell into the possession of a line of native rulers who succeeded in extending and consolidating their power. The present dynasty established itself in 1741. Selim I conquered Hejaz in 1517

and Yemen some years later. The caliphate of the Ottoman sultans was recognized in Hejaz until 1803, though the real power was in the hands of the grand-sharif. After the Wahabite occupation the Turkish government was restored, and the province is now ruled by a wali, or governor, sent from Constantinople. Yemen was lost to the Turks in 1630 and ruled by the imam of Sana until 1871, when the suzerainty of Turkey was recognized again. Meanwhile Aden (q.v.) had been taken by England in 1811. Towards the middle of the eighteenth century there appeared in Nejd a prophet, less original but also less self-indulgent than the founder of Islam, less radical but more sincere than Hamdan al Karmat, Mohammed ibn Abd al Wahhab. He was a stern reformer, preaching temperance and justice, himself an ascetic and a just man, unwilling to make any concessions or compromises, opposed to current superstitions, and counting as such the veneration of the Prophet, the saints, and the sacred places. Under his successors the Wahabite sphere of influence expanded. Kerbela was destroyed in 1802; Mecca was sacked in 1803 and remained in the hands of the Wahabites until 1813. Mohammed Ali sent his son Tusun to cope with this power, and later a greater general, his son Ibrahim, who by 1818 had greatly reduced its territory and prestige. The Saud dynasty at Riad continued, however, to be independent and only yielded to the growing strength of the Rashids at Hail. Mohammed Ali sent 11 expeditions into Asir, which was especially devoted to the Wahabite cause, but in 1841 had to conclude an inglorious peace. Asir is to-day practically independent, and even the Turkish control of Yemen is more nominal than real. Rebellion against Turkish authority has sometimes assumed the character of a regular war, as in 1891, when over 50,000 tribesmen are said to have engaged in a pitched battle, and again in 1905, when more than 100,000 men were drafted in Asia Minor and Syria for the war in Yemen, which was waged with varying success on both sides and does not seem to have issued in a materially changed relation of this province to the Turkish government.

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ARABIA DESERTA (Lat. Deserted Arabia). The name applied by ancient geographers to the northern and central third of the country. It is a region of hard, gravelly soil, diversified here and there by patches of stunted bush and meagre grass.

ARABIA FELIX (Lat. Happy Arabia). The name given to the southeastern part of Arabia; a tolerably fertile region.

ARABIAN ART. This term, though often erroneously applied to many divisions of Mohammedan art (q.v.), belongs properly only to those phases of the arts of design which grew



ARABIC CARVED PANEL FROM CAIRO.

up under Arab dominion, chiefly in Arabia, Syria, northern Africa, and Sicily. The Arabs were not originally an artistic nation, but employed the artists of the peoples they conquered in the seventh to ninth centuries. Gradually, like the Romans, they developed an architecture and decorative arts distinctly their own, wholly different from those of the conquered nations though derived largely from them. Architecture was highly developed in mosques and palaces; carving, inlaying of marble, wood, and mother-

of-pearl in intricate geometric patterns, manuscript illumination, calligraphy, and certain forms of work in brass and in glass, were brought to high perfection. As in most of the phases of Moslem art, the representation of living beings, human or animal, was rigidly excluded. The Moorish art of north Africa was an offshoot from the Arabic art of Egypt. Consult Gayet, *L'Art Arabe*; Bourgoin, *Les arts arabes* (Paris, 1873); Prisse d'Avennes, *L'art arabe* (Paris, 1877); Saladin et Migeon, *Manuel d'art musulman* (Paris, 1907); Fago, *Arte arabe* (Rome, 1909).

ARABIAN GULF. See RED SEA.

ARABIAN MUSIC. The influence of the Arabs upon modern music is distinctly felt in many of our orchestral instruments. Their musical system, however, has left no traces, because it was rather a philosophical and mathematical speculation than a practical system. Although in early times the Arabs had primitive instruments and characteristic melodies, we cannot speak of a distinctly Arabic system of music until after the conquest of Persia by the Arabs in the seventh century A.D. With wonderful rapidity the conquerors assimilated the musical art of the conquered, so that in a short time the pupils rose to the position of masters. Since then the music of Persia and Arabia is like two great streams flowing side by side and frequently intermingling. Already in the eighth century we find theoretical writings on music by Arabic authors. When Al Farabi, in the tenth century, attempted to supplant the Arabic system by that of the Greeks, he failed, because the Arabic-Persian system had already reached a high development. The theoretical founder of the Arabic-Persian school is Sifa al-Din, an Arab by birth, who lived in the fourteenth century. The Arabic system constructed a scale by joining together a tetrachord (D, E, F#, G), and a pentachord (G, A, B, c, d), so that the semi-steps are between the third and fourth and sixth and seventh degrees. Each whole tone was divided into three third tones, so that the octave contained 17 third tones. These third tones were not regarded as chromatic alterations of a fundamental tone, but were denoted by the theorists by separate numbers, so that the first tone of the second octave was 18, of the third octave 35. Octaves and fourths are regarded as consonances, thirds and sixths as dissonances. The fifth was a disputed interval. Out of a possible number of 84 scales, the theorists selected 12 as practicable. These were called *Makamat*. Besides these complete scales there were recognized six *Awasat*, combinations of from five to nine third tones, which stood in the same relation to the scales as the tropes of the Plain Chant stood to their respective modes. While the theorists continually introduced new systems of wonderful ingenuity, the practical musicians were guided chiefly by their ear, and this led them to conceive their melodies in a scale corresponding exactly to our D major. The principal instrument of the Arabs was the lute (q.v.), which they adopted from the Persians. The tanbur had a circular or oval body, a very long neck and three strings. The kanun was a kind of cembalo with 75 gut strings (three to each tone) over a square resonator. Among the instruments played with a bow the principal one was the rebab or rebic, which has developed into our violin. The kemangeh was made of a cocoanut over which

was stretched a membrane. The strings were fastened on an excessively long and thin neck. The chief wind instrument was the zamr or zurna, a kind of oboe. The nefyr is a trumpet similar to ours. The nakarich is our kettle-drum. The number of instruments used by the Arabs is enormous. There are 32 kinds of lutes, 12 kinds of kanuns, 14 instruments played with a bow, 3 kinds of lyre, 28 kinds of flute, 22 kinds of oboes, 8 kinds of trumpets, and drums. Consult Land, *Over de Toonladders der Arab. Musick* (Amsterdam, 1880); A. Lappage, *La musique arabe* (Paris, 1905); J. Rouanet, *La musique arabe* (Algiers, 1905); J. Rouanet and E. N. Yafil, *Répertoire de musique arabe et maure* (Algiers, 1905); R. Mitjana, *L'orientalisme musical et la musique arabe* (Upsala, 1907); G. Tesenti, *Canti e ritmi arabici* (Rome, 1910); P. Tripodo, *Lo stato degli studi sulla musica degli Arabi* (Rome, 1904).

ARABIAN NIGHTS. The common English title of a collection of stories called in Arabic *alif laila wa laila*, 'Thousand and One Nights.' In regard to the number of the stories as well as their form and arrangement the different copies of the text vary greatly. There are, as Zotenberg has shown, three distinct groups of manuscripts: (1) those from Asia containing, as a rule, only the tales told on 281 nights, but presenting a comparatively old and excellent text; (2) those from Egypt, more complete but scarcely more than a century old; and (3) some of Egyptian or Tunisian origin showing the influence of both types. None of these manuscripts contains all of the stories; and the Arabic text of some of the most famous among them has only been found and published in recent years by Zotenberg and Nöldeke. This variation in the manuscripts, while also an index of the popularity which the collection enjoyed, is due to their gradual growth and to the different centres in which the traditions regarding them developed. They were first made known to Europe by Antoine Galland (1646-1715), a French Orientalist, who succeeded, after much effort, in obtaining a manuscript. Between 1704 and 1717 Galland's translation appeared in 12 volumes under the title of *Mille et une Nuits, contes Arabes traduits en Francais*. The stories of the eleventh and twelfth volumes Galland did not find in any manuscript, but heard them from the lips of the Maronite Hanna, who had accompanied the physician Declos to Paris. Hanna seems to have used a manuscript not known to Galland. Among his stories were those of Ali Baba and the Forty Thieves, Ali Khuja, the Bewitched House, Ahmed and the Fairy, and the Two Jealous Sisters. While received with great enthusiasm by the general public, doubts were freely expressed in learned circles as to the genuineness of the tales published by Galland. Oriental scholars did not hesitate at first to declare against their authenticity and denounce them as forgeries. Having taken only an obscure place in the literature of the East, and their style unfitting them from being classed among models of eloquence or taste—having no object of a religious, moral, or philosophical nature in view, while the manners and customs delineated in them were different from all received ideas of those of the Moslem nations—their success took the critics by surprise. It was not long, however, before such skepticism gave way, and they were recognized

not only as genuine productions but as a characteristic expression of eastern thought and manners. The success of Galland's translation spread the tales throughout Europe. Few books have been translated into so many different languages and given delight to so large a number of readers. In addition to the translations into European languages we must bear in mind that the Arabic original has also been the source of renderings into many eastern tongues, notably Persian, Turkish, and Hindustani, so that more than any other compilation, with the single exception of the Bible, the Arabian Nights has encircled the entire world. It may be said that in these Oriental tales there has sprung up a new branch of literature, for their influence on the literature of the present day is easily discernible. Here are found depicted, with much simplicity and great effect, the scenes of the town life of the Moslem. The prowess of the Arab knight, his passion for adventure, his dexterity, his love, and his revenge, the craft of his wives, the hypocrisy of his religious teachers, and the corruptibility of his judges, are all dramatically delineated—far more vividly represented, in fact, than is possible in a book of travels; while gilded palaces, charming women, lovely gardens, and exquisite repasts captivate the sense of the reader and transport him to the land of wonder and enjoyment. Besides entertaining the mind with the kaleidoscopic wonders of a teeming and luxurious fancy, which is their most obvious merit, they present a treasure of instruction upon life in general and Oriental life in particular. This is undeniable, notwithstanding the fact that the aspects of society they depict are far from standing high in the social scale either as to civilization or morality.

The inquiry into the origin and date of the Arabian Nights may be said to have begun with Galland himself. In his dedicatory epistle he suggested that the stories came from India by way of Persia and took their present form in the middle of the thirteenth century. Scott, in 1811, indicated his belief that the original Arabian Nights consisted of a far smaller number than the 1001 in 36 parts, and that upon the original stock various novelists of the Moslem world engrafted their performances. Hammer-Purgstall was the first to call attention, in *Journal Asiatique*, pp. 253 ff. (1827) to a passage in Masudi's *Muruj al dhahab*, written in 947 A.D., referring to a book called "Thousand and One Nights" translated from a Persian work entitled *Hazar Afsanah*, or 'Thousand Tales,' telling the story of the King and his wazir, Sharazad and Dinazad. De Sacy replied in the *Mémoires de l'Académie des Inscriptions*, pp. 30 ff. (1833); showing evidence of an Arabic-Egyptian origin and a date as late as 1450. Hammer-Purgstall reiterated his opinion in *Journal Asiatique*, pp. 175 ff. (1839); and quoted another passage from Nadim's *Kitab al Fihrist*, written 987, confirming Masudi's account. The story known to Masudi and Nadim has many points of resemblance to our *Arabian Nights*. In both the framework is essentially the same—a king who was in the habit when wedding a damsel to kill her after having spent one night with her, and a damsel who entertained a king with stories so fascinating that he respited her each night in order that he might hear the continuation. This continued for 1000 nights, at the end of which period the

king decided to preserve his consort's life. Nadim also gives the name of the heroine as Shahrazad, and says that the book was written for Humai, daughter of Bahman. Firdausi makes Humai the daughter and wife of Bahman Ardashir, i.e., Artaxerxes Longimanus. Lane, in 1839, sided with De Sacy and emphasized the points that seemed to indicate an Egyptian origin at the end of the Mamluk, or beginning of the Turkish, period. That was substantially also the attitude of Weil (1838). De Goeje distinguished between the final edition in Egypt, c.1450 and the earlier forms of the work, made the translation of the Persian *Hazar-Afsanah* the nucleus, and regarded this Persian story as a variation of an old Persian legend of which another form is found in the Book of Esther (*De Gidd*, 1886). Burton in his *Terminal Essay*, which also appeared in 1886, took the same view, except that he did not attempt to trace a connection between the Persian heroine and Esther. The necessity of eliminating later glosses was suggested by A. Müller in *Bezenberger's Beiträge* (1888); and Zotenberg, on the basis of a careful examination of the various groups of manuscripts, hinted at an earlier eastern and a later Egyptian form of the collection, *Notices et Extraits des Manuscrits de la Bibliothèque Nationale*, pp. 167 ff. (1887). Mardrus thinks that 13 stories go back to the tenth century, that the collection as a whole assumed a definite shape in the thirteenth century, and the same tales may be as late as the sixteenth. The title, however, of the book known to have existed in the tenth century seems to suggest a much larger number. There are 264 stories, divided on 1001 nights, in the manuscript that has the most. The Achikar story found among the recently discovered Elephantine papyri (q.v.) shows that this kind of literature flourished and was widely spread in the Achæmenian period. While there is little resemblance between Esther and Shahrazad, and Ahasuerus (q.v.) is not Artaxerxes, but Xerxes, it is, therefore, not impossible that the romance was written in the Seleucid period or even before Alexander. That Shahriar appears as a Sasanid king, reigning in the Ganges valley, and having his brother as vassal in Samarkand shows how even the framework suffered change; and new stories were undoubtedly substituted for, and added to, the old ones. The additions made in Egypt must have been considerable, and the interpolations and changes in the text numerous.

Regarding the character of the stories and the material contained in them, we may distinguish three categories: (1) beast fables, (2) fairy tales, and (3) anecdotes. Of these, the beast fables represent probably the oldest structure, reverting, as they eventually do, to the primitive beliefs which attributed to animals human powers and evident superhuman faculties. Some of them are clearly of Indian origin, coming from the Panchatantra which was translated into Persian in the reign of Khosru Anushirvan (531-579), and from Persian, into Arabic by Mnkaffa in the time of Almanzur (754-775). The fairy tales show the eastern imagination at its best, though it should be remembered that some of the tales are transformed myths that again belong to a more primitive age than one which was able to exercise the imaginative fancy for its own sake, independent of doctrines or of symbolical purposes. Burton assumes that

the fairy tale proper in the *Arabian Nights* is "wholly and purely Persian" (*Terminal Essay* to his translation, p. 127), and so far as the stimulus toward this branch of literature is involved, he is unquestionably right. Characteristically Arabic, on the other hand, are the stories introduced to prove a point or to point a moral, while the incidents and anecdotes, historical and otherwise, are likewise the genuine production of the Arabic mind. The poems introduced into the stories, to which justice is done only in the excellent translation of Burton, are drawn either from the *Moallakat* (q.v.), the courts of Harun al Rashid, al Asma'i and Abu Nuwas, al Hariri's *Makamat*, or the later Egyptian poets.

In judging of the obscene allusions with which many of the tales are well stocked, and the frankly indelicate manner in which incidents are related that shock Occidental sensibilities, it must be borne in mind that many themes may be discussed in the Orient with perfect simplicity that would be regarded as improper among us, so that not everything which seems obscene was really intended to be such. But making due allowance for this difference between the Oriental and Occidental point of view, there remains a large residuum of erotic material that is undoubtedly introduced to add piquancy to the tales. Such material, however, has its value for the student of customs and manners, who is given an insight into conditions existing at one time in the Orient which is not to be had in any other way. Indeed, apart from the entertaining character of the tales, they abound in references to religious and social customs and manners of thinking that make them a perfect storehouse of valuable material for the one who wishes to study the Orient, and modern scholars have done much toward utilizing this material in their researches regarding Mohammedanism and Arabic antiquities as well as Arabic history. No systematic study has as yet been undertaken of the relations of the Arabian Nights to Mediæval European literature. In Boccardo's *Nuova Enciclopedia* (1882) the article on *Mille e una notte* discusses the possible influence on Boccaccio and Giovanni of Florence, and the manifest imitation of Shahryar in Ariosto's *Astolfo*. Toldo, in *Miscellanea di Studi Critici in honore di Arturo Graf*, pp. 491 (1903), suggests that some other stories found their way from the *Arabian Nights* of the tenth century to France, Italy, and Germany. Further investigation along these lines would be of great value.

The best editions of the Arabic text are those of Macnaghten (Calcutta, 1839-42; lithographed, Bombay, 1879) and the Bulak editions of 1835 (2 vols.) and 1885 (4 vols.). A shorter and at times expurgated text is given by M. Habicht and Fleischer (12 vols., Breslau, 1825-43). That of Salhani (5 vols., Beirut, 1888-90), is even more changed, not to offend Christian taste. Galland's French (1704) was soon followed by an English rendering, which as early as 1713 had already reached a fourth edition. The first English translation which in part, at least, was made from the Arabic was by Jonathan Scott (6 vols., 1811). It was not complete. Torrens, in 1838, began an independent translation, of which, however, only one volume was published. E. W. Lane published a translation which gave only an abridged text. Of the 100 tales in the Bulak edition he

rendered only half into English; a popular edition was published in 1847, *The Thousand and One Nights*. The notes constitute a valuable feature. Lane's edition has been repeatedly re-issued, the last one being in six volumes, edited by Joseph Jacobs (London, 1898). John Payne's translation, based upon the Macnaghten MSS. and prepared for the Villon Society, was issued in nine volumes (London, 1882-84). It was a work of great merit as a literary production, but was privately printed and is very scarce. The most excellent English translation, however, is that of Sir Richard Burton, in ten volumes (1885-86), with a "Terminal Essay" embodying the results of Burton's researches as to the origin, age, and character of the tales. To this he subsequently added six supplemental volumes (1887-88), containing tales not included in Macon's edition and drawn from other printed texts and manuscripts. An abridged and expurgated edition of Burton's work was prepared by Lady Burton and issued in six volumes (London, 1887-88). There are four noteworthy translations in German. The earliest was that of Habicht published at Breslau in 15 volumes (1824-25). This was followed by a translation by Zinserling, which was based upon the French translation of Hammer-Purgstall (3 vols., Stuttgart, 1823). Gustav Weil's translation appeared in three volumes at Stuttgart in 1838-43, and that of Max Henning in the *Reclam Universal Bibliothek* (Leipzig, 1896 et seq.). Of these the most reliable is that of Weil. In France Galland's translation has been superseded by that of Mardrus in eleven volumes (Paris, 1899-1904), and editions have been issued by Caussin de Perceval (9 vols., Paris, 1806), Edouard Gautier (7 vols., 1822-24), M. Destain (6 vols., 1823-25), and Silvestre de Sacy (3 vols., 1838).

The success of Galland's venture gave rise to many imitations that appeared in France, England, and Germany, all more or less expurgated and altered to adapt them for popular use. A complete bibliography of the *Arabian Nights* is given in Chauvin, *Bibliographie des ouvrages arabes*, vol. v (Paris, 1901).

ARABIAN SEA (anciently, Lat. *Mare Erythræum*, or the Red Sea) (Map: Asia, F 7). The northwestern part of the Indian Ocean, lying between Arabia, India, and Baluchistan. Its southern limit is generally supposed to be on a line from Cape Comorin, in Hindustan, to Cape Guardafui, in Africa. By the Gulf of Aden it communicates with the Red Sea and also with the Mediterranean through the Suez Canal (q.v.). On the northwest it forms the Gulf of Oman, with its continuation called the Persian Gulf. Among its eastern inlets may be mentioned the gulfs of Cutch and Cambay. The only important river it receives is the Indus, from the east. Its most important islands are the Laccadives and Socotra. The commercial significance of the Arabian Sea was very great in ancient times, when the products of the Orient were conveyed hither by sea to be transported by caravans to Europe. But with the discovery of the all-sea route to India, in 1497, its importance was lost until the opening of the Suez Canal in 1869 gave a fresh stimulus to commerce in that quarter. At present it is again a busy water thoroughfare. Consult C. F. Oldham, "Topography of the Arabian Sea," in *Asiatic Journal*, vol. lxiv (Calcutta, 1896).

ARABIA PETRÆA (Lat. Rocky Arabia).

The northwestern and more hilly region of Arabia, into which *Arabia Deserta* merges.

ARAB'ICI, or **ARA'BIANS**. A sect in Arabia, in the third century, which held that the soul dies with the body and will be raised again with it. Eusebius says that Origen, at their invitation, held a debate with them at a considerable synod, convinced them of their error, and they renounced it.

AR'ABIC LAN'GUAGE AND LIT'ERATURE. The Arabic is one of the Semitic languages (q.v.). Arabia is generally supposed to have been the home of the whole Semitic family at a remote period of history. Even if, as many scholars think, the stock originally came from Africa, it is admitted that the peninsula was the distributing centre of the vast majority of Semites. From there the Akkadians (see **ACCAD**) pushed their way into Babylonia, the Amorites and Hebrews into Syria, and the Aramæans into the countries around the Syrian desert. What the language of Arabia was in the fifth millennium B.C. can only be inferred from a comparison of the four great branches of Semitic speech; and such a comparison suggests that even then there were marked dialectical differences, becoming accentuated among the emigrants in their new environment and developing within Arabia itself. Our earliest inscriptions, coming from Yemen and possibly going back to the second millennium B.C., reveal certain archaic features already lost in the Akkadian, showing the persistence of the original type. While these inscriptions indicate the general character of the language in the extreme south, we have as yet only slight hints as to how man spoke in other parts of Arabia 3000 years ago.

More than 2000 inscriptions secured through Halévy, Euting, and especially Eduard Glaser (q.v.), have made us to some extent acquainted with the various dialects spoken in Yemen, Kataban, and Hadramaut during a period of, at least, 1500 years. Aside from *su* instead of *hu* and initial *s* in the causative, peculiar to the Minæan and connecting it with the East Semitic languages, and certain minor differences, a remarkable stability characterizes the written language of south Arabia throughout these centuries. (See **MINÆANS**; **SABÆANS**.) The spread of Islam, and with it the language of the Koran, caused the gradual disappearance of the earliest known type of Arabic. Only survivals of it are found in the modern dialects of Mahra, Shihra, and Socotra. As to the origin of the peculiar script used for it in ancient times some scholars hold that it is an adaptation of the North Semitic alphabet, while others maintain that it developed independently as the result of contact between Minæan colonies in north Arabia and the Philistines in Gaza and the Negeb who had come over from Crete, where a system of writing had long been in vogue. (See **ALPHABET**; **CRETE**.) Elements of the South Semitic alphabet are found in north Arabia in the Lihyanian, Thamudenic, and Safaitic inscriptions. In a greatly modified form language and script have both survived in the Tigrina, the Tigre, and the Amharic. See **ETHIOPIC**.

It was the North Arabic, however, that was destined to become one of the great languages of the world, in the hands of the pre-Islamic poets, Mohammed and the Moslem writers. It adopted a later form of the Aramaic alphabet.

By a system of diacritical points new letters were formed making it possible to indicate a number of consonantal sounds for which the Aramaic alphabet had no special characters; while, on the other hand, some of the Aramaic letters were not used. At a later time some letters were used, in an abbreviated form, to indicate the main vowel sounds, and others were employed to signify certain peculiarities of pronunciation. It is now known that the rounded cursive script, the *Neskhi*, is not a modified form of the more pointed Kufic, as was for a long time supposed. The former has been found in papyri dated in the seventh century, and it is probable that the Koran was first written in this script. The Kufic, first employed in the city of Kufa, was one of several variations, intended to give the writing a more ornate form. It was used, along with the *Neskhi*, for some centuries.

Before Mohammed the speech of the North Arabian tribes found its most perfect and beautiful expression in the songs of the great poets. In comparison with this classical language the Koran exhibits certain peculiarities of the prophet's own dialect, that of the Kuraish in Mecca. These were to some extent obscured, but not obliterated, by the later vocalization which was done on classical models. While the language of the Koran profoundly influenced theologians and jurists, poets naturally sought their patterns among the acknowledged masters of the past; and it may be said that the language of the songs became the literary language of the Moslem nations. Since the Koran must be used and explained, and the daily prayers offered, in Arabic, the language spread far and fast among the converted or conquered peoples. But it could not long remain unaffected by the vernacular in the lands subjected to Islam, and, as all parts of Arabia participated in the conquest, dialectical differences also tended to spread and to perpetuate themselves. The earlier history of the modern dialects is little known. There are some songs and stories, however, from Irak, Africa, and Spain, already quoted in the Middle Ages, that show the peculiarities characteristic of the dialects of Babylonia and northwest Africa. At the present time the main dialects are those of Arabia, Syria, Irak, Egypt, northwest Africa, and Malta.

The literature in this language may be divided into the following periods: (a) 328-610 A.D., (b) 610-750, (c) 750-1000, (d) 1000-1258, (e) 1258-1517, (f) 1517 to the present time. To the pre-Islamic period belong a few Syrian inscriptions, like those of al Namara (328), Zabad (512 and 513), and Umam al Jimal. The most important productions, however, are the songs of famous poets of which collections were made by Moslem authors. Among these are the *Moallakat*, a *diwan* made by Hammam, consisting of a characteristic song of each of the following poets: Amr al Kais, Antara, Labid, Tarafa, Zuhair, Amr ibn Kulthum, and Harith ibn Hilliza. Other names were substituted for the last two, or two more were added, in later collections. The name "Moallakat" means 'the excellent ones' and not 'the suspended ones,' as it was understood by some Moslem writers who, ignorant of earlier conditions, imagined that they had been hung upon the Kaaba in Mecca. Another *diwan* was made up by al Alam consisting of six poems by Amr al Kais, Antara, Labid, Tarafa, Nabigha, and Alkama. Songs

have been preserved in later *diwans* of a very large number of pre-Islamic poets. Among them were such men as Umayya ibn abi al Salt, Kab ibn Zuhair, al Absi, Shanfara, a Jewish poet, Samu'al ibn Adiya, and a Christian, Adi ibn Zaid of Hira. There were also poetesses in Arabia in pagan times. The treasury of ancient song was gathered together in the *Mufaddaliyat*, the *Hamasa* of Abu Tammam (q.v.); the *Hamasa* of al Buhturi, the *Kitab al Aghani* of Abu'l Faraj al Isfahani, the *Jamharat ash'ar al 'Arab* of Abu Zaid, the *Ikd al farir* of Ibn al Rabbihi, the *Mukhtarat al Shaarai* and elsewhere. The songs of the Banu Hudhail and those of the poetesses also formed such *diwans*, or collections. Besides the *shair*, or singer, the *rawi*, or narrator, also cultivated his art, and some stories have come down to us. The text of all these pre-Islamic productions is often fragmentary and poorly preserved. A new period began with Mohammed (571-632). The Koran, which gave birth to a religion and which founded the greatest politico-religious system of the Middle Ages, soon dominated all branches of intellectual activity. The earliest products of this domination were grammar and lexicography, the necessary instruments for the exegesis of the Koran. Schools were founded in Basra, Kufa, and Bagdad, where the sciences were studied, especially by Persian Mohammedans. Such a one was the first grammarian of Basra, Abd al-Rahman ibn Hormuzd (c.730). Among the noteworthy grammarians and lexicographers may be mentioned: Abu'l-Aswad al-Duali (eighth century), the inventor of the diacritical points; Khalil ibn Ahmad (718-791), of Oman, the founder of Arabic metrics and the author of the first Arabic lexicon, *Kitāb al-'Ain*; his disciple, Sibawaihi (796), author of an extensive grammar (translated into German by Jahn, Berlin, 1894); Ibn Duraid (d.934), author of the lexicon *al-Jamharah*; Ismail ibn Abbad al-Sahib (d.995), author of the lexicon *al-Muhit*; Jamal al din abu'l Fadl Mohammed b. Mukarram b. Manzur al Ansari (1232-1311), author of an extensive lexicon, *Lisān al-'Arab*; al-Zamakhshari (d. 1143), author of a grammar, *al-Mufassal*, and a lexicon, *Assās*; and Ibn Malik (d.1273), who wrote a grammar in 1000 verses under the title *Kitāb al-Alfiyah*.

As all Mohammedan philosophy, theology, law, and statecraft is derived primarily from the Koran, its interpretation became the object of discussion at a very early period. Hence an immense literature of commentaries and super-commentaries grew up, only the most important of which can be mentioned: those by al-Tabari (d.923), Hasan al-Nisaburi (d.1015), Abu'l Kasim ibn Satama (d.1019), al-Zamakhshari (d.1143), Mohammed al-Kurtubi (d.1272), Fakhr al-din Razi (d.1209), al-Baidawi (d.1286), and Jalal al-din al-Suyuti (d.1505). But Mohammedanism, as a system, rests as much upon the oral as upon the written law. The sayings and doings of Mohammed and his immediate followers form the science of the Hadith or traditions, which vary both as to value and authenticity. Around these there has also grown up a large literature; the great collections of such traditions were made by al-Bukhari (d.870), Muslim (874), Ibn Maja (d.887), al-Tirmidhi (892), and Abu Dawud al-Sijistani (d.941).

As early as the end of the seventh century,

a school of Mohammedan jurisprudence was founded in Medina by Abd Allah ibn Masud (d.652), Abd Allah ibn Abbas (d.687), and Sulaiman ibn Yasan (d.722). Its decisions were collected toward the end of the eighth century by the distinguished jurist Malik ibn Anas (d.812) whose *'al-Muwatta'* became the code for Hejaz, Tunis, Algeria, and Morocco, and was further developed by Yahya ibn Yahya Utbi (d.868), and Ibn abu Zaid al Kairawani (d.999). There are three other recognized codes, of Abu Hanifah (d.767), recognized in Bagdad, Transoxiana, India, China, and by the Turks, of Muhammed al-Shafii (d.820), recognized in Egypt, Iran, and Java, and of Ahmad ibn Hanbal (d.855). Other codes, to the number of 72, are proscribed as heretical. These have produced an extensive literature of commentaries and pandects, which has not exhausted itself in our own day.

The activity of the Mohammedans was not confined to philological and theological studies. With the accession of the Abbasides a new field was opened by the introduction of foreign civilizations. Learned men were invited from other countries and remunerated in a princely manner. The works of Greek, Syriac, Old-Persian, and Indian writers were translated into Arabic. Schools of philosophy were founded at Bagdad, Cordova, Cairo, etc., where the writings of Aristotle, Plato, and the Alexandrian philosophers were expounded and commented upon. Dogmas, hitherto regarded as sacred, were freely discussed and rejected. (See MUTAZILITES.) From these schools issued the philosophers al-Kindi (eighth century), al-Farabi (960), Ibn Sina (Avicenna 980-1037), al-Ghazzali (1111), Ibn Bajah (1138), Ibn Tufail (d.1185), and Ibn Roshd (Averroes, 1153-98), whose works, subsequently translated into Latin, were studied for many centuries in European universities.

In mathematics the Mohammedans made great advances by introducing the numerals and other modes of notation, the sine instead of the chord, and by extending the application of algebra. Astronomy was zealously cultivated in the schools of Bagdad, Cairo, and Cordova. According to Ibn al-Nadbi (1040), the library at Cairo possessed two celestial globes and 6000 astronomical works. In the ninth century the three sons of the librarian, Musa ibn Shahr, calculated accurately the diameter of the earth and the precession of the equinoxes. At the same time lived al-Farghani, author of an astronomical encyclopædia, which was translated in the twelfth century by Johannes Hispalensis. In the tenth century al-Battani (Albatagnius) flourished, to whose name is attached the introduction of trigonometrical functions, and the observation of the obliquity of the ecliptic. Among the astronomers whose works were translated into Latin may be mentioned Thabit ibn Korrah (901), Jabir ibn Aflah, who in 1196 constructed the first observatory at Seville, and Nasir al-din al-Tusi, the paraphraser of Euclid. Medicine and natural history were cultivated by the Mohammedans with a like success. In the seventh century the writings of Galen, Hippocrates, Paul of Ægina, etc., were translated from the Greek into Arabic. Ibn abi Usaibiah (1203-69) devotes a whole volume to the medical literature in Arabic. Among the medical writers may be mentioned Mohammed al-Razi (tenth century), whose works were translated into Latin; Ali ibn Ridwan (1061); Ibn Sina

(Avicenna); Abu'l-Kasim (1107), who wrote on surgery and surgical instruments; Abd al-Malik ibn Zuhr (1162), and Abd Allah ibn al-Baitar (1248), whose *Materia Medica* had great vogue.

History in all its forms was cultivated at an early time by the Mohammedans; several chronicles were written in the days of the Umayyad dynasty. Persian historiography influenced the Arabs to record the events of their past life as a people; and the growing interest in the prophet and his times furnished a healthy stimulus. From the middle of the eighth century we have an uninterrupted series of historians. The earliest of these were Mohammed ibn Ishak (d.768), whose biography of Mohammed was enlarged by Ibn Hisham (d.821), and Mohammed al-Wakidi (d.822), who wrote the history of the prophet at Medina. No less than 140 titles of works written by al-Kalbi (c.819) are mentioned, dealing largely with history and genealogy. It was a Persian, Abu Jafar al-Tabari (838-923), who produced the first universal history in Arabic, beginning with creation. A similar work was produced by Ibn al-Athir (1160-1234). Of the early historians mention must also be made of Ibn Kutaibah (892) and al-Baladhuri (892), who deals especially with the early conquests of the Arabs. In the tenth century wrote al-Hamdani (945), Hamzah al-Isfahani (961), and al-Masudi (956), who has left us a history of civilization. Among the historians of later centuries mention may be made of Ibn Maskawai (1030), al-Makin (1273), Ibn al-Amid (b.1254), al-Biruni (1308), historian of chronology and the Herodotus of India, Abu'l-Fida (d.1331), and Ibn Khaldun (d.1406), the greatest of all Arabic historians and the first to compose a philosophy of history. The chief historians of Spain were Ahmad al-Dhabbi (1195), Ibn Bashkuwal (d.1182), Mohammed ibn al-Abbar (d.1259), and Ahmad al-Makkari (d.1631). Among the noted historians of Egypt were Abd al-Latif (d.1231) and al-Makrizi (d.1441), of Maghrib al Kairawani (d.1070) and Ibn Khaldun; and of Spain al Kustubi (d.1182). More characteristic of Arabic historiography are the numerous local histories and biographical monographs produced. Among the most remarkable of these are the works of Jalal al-Din al-Suyuti (1505), author of 510 works, among which were histories of Cairo and Damascus; of Abu Ubaidah (d.824), author of 105 monographs, among which are histories of Mecca and Medina; of Ali ibn Asakir (1175), author of a history of Damascus in 80 volumes, of Baha al-din ibn Shaddad (1234), author of a history of Aleppo, Mohammed al-Shahrastani (1153) wrote a history of religious and philosophical sects which is still our chief authority on the subject. The most noteworthy biographical writers were Abu Zakariyah al-Nawawi (1274) and Ibn Khallikan (1282), who treats of 865 persons. Bibliography was treated of by Mohammed ibn Ishak al-Nadim (995), who wrote the *Kitab al Fihrist*, Ali ibn Yusuf al-Kifti (1248), and Hajji Khalifa (1658). With the exception of Ibn Khaldun the Arabic historians lack critical sense; they are mostly mere chronographers. In geography they displayed much greater ability and have left us works of lasting value. The chief geographical writers are Ibn Hisham, Khurdadhbeh (d.912), al-Masudi, Ahmad ibn Fadlan (d.921), Abu Ishak al-Istakhri (tenth century), Ibn Haukal (d.977), al-Mukaddasi (d.985), the traveller Ibn Batutah (d.1377),

Yakut (d.1178), who, like al-Bakri (d.1094), wrote an extensive geographical dictionary, al-Kazwini (d.1276) and Abu'l Fida.

Besides these advances in the solid branches of knowledge the genius of the Arabs continually flowered into poetry. From Bagdad to Cordova the Mohammedan world was full of sweet singers. Collections of the works of older poets (*diwans*) were made, of single writers, and of the poems of individual tribes, or arranged according to the subject matter of the poems. In the Umayyad period Akhtal, Farazdak, and Jarir are considered the greatest poets. A woman, Laila al Akhyaliyya (d.706), also won fame. Abu Nuwas, Muti ibn Ayas, Muslim ibn al-Walid (d.757); Abu'l Asahiya, Abu Tammam, Abu Firas (d.968, Mutanabbi, Ibn Farid, the mystic and Abu'l Ala al Ma'arri, were the most eminent poets in the flourishing period of the Abbasides. The royal poets Abd al-Rahman (d.788) and Al-Mutamid (d.1095) of Spain; al-Tughrai (d.1120), the panegyrist of Mohammed, al-Busiri (d.1279) and Umar ibn Rabia (d.1328) also deserve mention. Though much of this poetry was scholastic in form al-Mutanabbi (965) is considered one of the greatest Mohammedan poets and his *diwan*, with its 289 poems, was always widely read. A new species of poetry was invented, the *Makamat*, a sort of rhymed prose in a finished and most ornamental style and exhibiting merely the literary prowess of the writer. Of such a kind were the writings of Ahmad al-Hamadhani (d.1007) and Abu Mohammed al-Hariri of Basra (d.1121). Side by side with this scholastic poetry there grew up a large mass of popular verse, which refused to be bound by the canonical metres and which developed the strophe, otherwise unknown to Arabic literature. A particular form of this was the *Muwashshah*, or girdle poem. The epistolary style developed by Abu Bekr al Khwarizmi (q.v.) and further by Al Hamadhani (q.v.), reached its perfection in the works of Abu'l Ala al-Ma'arri (q.v.), one of the foremost poets in the Moslem world and a very radical thinker. A popular and at times fantastic prose literature also made its appearance, in which the eastern craving for the wonderful and gorgeous was richly gratified. This was largely influenced by non-Arabic literatures, as in the *Fables of Bidpai*, translated in 750 by Abd Allah ibn al-Mukaffa from the Persian, in *The Seven Wise Masters*, and in the *Arabian Nights* (q.v.). Pure Bedouin romances are the stories of *Saif ibn dhi Yazan*, of the *Banu Hilal*, of *al Zir*, and especially the *Antar Romance*, which gives the most faithful picture of desert life, and which was not without influence upon the romance and chivalry of mediæval Europe.

All this culture of the early centuries of Mohammedanism presents a strong contrast to the decline which is evident from the ascendancy of the Turks in the sixteenth century to our own day. Scholastic discussions on dogmatics and jurisprudence, and purely grammatical disquisitions became the order of the day. The expedition of Napoleon to Egypt presaged the introduction of western culture to the East, and a slow intellectual resurrection has commenced. The printing presses of Bulak, Fez, Constantinople, Beirut and of several Indian cities are extremely productive, and edition after edition is quickly exhausted. Newspapers in Arabic are now published all over the East, and even in western cities, e.g., Paris and New York. Writ-

ers have also begun to attempt, with more or less success, to imitate European forms of thought and sentiment. Of these may be mentioned Michael Sabbagh of Syria (*La Colombe Messagère*, Arabic and French, Paris, 1805); the Sheik Riffa of Cairo (*The Broken Lyre*, Paris, 1827); *Manners and Customs of the Europeans* (Cairo, 1834); *Travels in France* (Cairo, 1825). But despite all this, the results obtained in Egypt during the period from 1798 down to the English tutelage, in 1882, were meagre. Mohammed Ali introduced the printing press in 1821 and founded a school for mathematics. Some of the works of the best European writers were translated into Arabic; the vice-regal library was founded in Cairo in 1870. Few great scholars and writers have as yet appeared; and it is as yet uncertain whether the attempt to develop the common speech into a literary language will be more successful. The endeavor to substitute the Roman script for the Arabic (furthered notably by Prof. W. Fiske) has not been effective. Only in Malta has the Latin alphabet been used for the last 60 years. The following modern poets deserve mention: Hasan al-Attar (1766-1838); Abd Allah Pasha al-Fikri (1834-90); Aisha Ismat Hanun, daughter of Ismail Pasha; and Mohammed Uthman Jalal (b.1829), the translator of Racine and Molière. To these may be added the historians Abd-Allah al-Sharkawi (1737-1812, and Abd al-Rahman al-Jabarti (d.1826), both historians of the French occupation; Ali Pasha Mubarak (1823-93), the topographer of Cairo and Alexandria; and the great jurist Ibrahim al-Bajuri (1783-1861), rector of the al-Azhar University. In Syria the beginnings of a new life are due to European and American efforts. The American Presbyterian missionaries and the French Jesuits (since 1869) have started a new life in Beirut by means of the printing press and modern schools. A real interest in the old literature has been awakened, many of the masterpieces being reëdited in a critical spirit. In this connection may be mentioned the philologist and poet Nasif al-Yaziji (1800-71), who wrote the critical observations in De Sacy's edition of Hariri (*Epistola Critica*, Leipzig, 1848); Butrus al-Bistani (1819-83), author of a dictionary and a general encyclopædia; Ahmad Faris al-Shidyak (d.1884), the grammarian; Khalil Sarkis (1877), the historian of Jerusalem; and Louis Cheikho, the learned editor of the old Arabic poets. In the old home of the faith, Mecca, literary activity still continues to our own day, but upon the old theological and dogmatic lines. Worthy of mention are Ahmad Dahlan (d.1886), theologian and historian, the author of more than 20 works, and Mohammed ibn Umar al-Nawawi, by origin a Malay, the author of 18 works upon different subjects, the first of which appeared in 1879. In India European influence in literature is confined to the publications of the *Biblia Indica*; and to a few writers such as Siddik Hasan, husband of the Sultane of Bhopal (d.1889). The same condition prevails in the Maghrib (North-west Africa). But French culture has already begun to exercise an influence upon Arabic literature in Algiers; and the same may in course of time be expected from the French occupation of Morocco (1911). As yet, however, productions of the lithographic press at Fez are all confined to the older Islamic theological, legal, and historical literature.

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ARABIC NUMERALS. See NUMERALS; and ALGORISM.

ARABIC VER'SIONS. See BIBLE.



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